THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LXXVI. No. 1956.] LONDON, NOVEMBER 6, 1900. [52ND YEAR. PRICE 6d.

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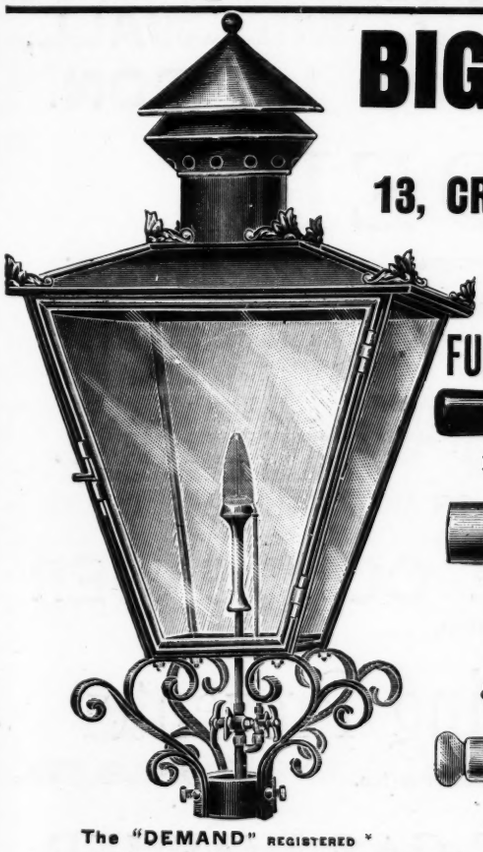
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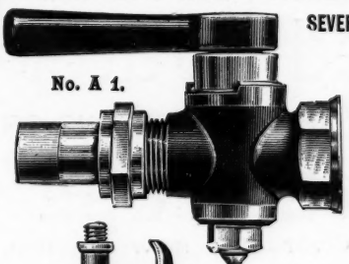
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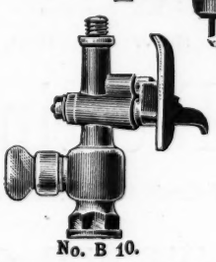
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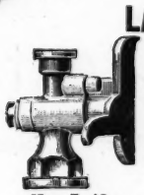
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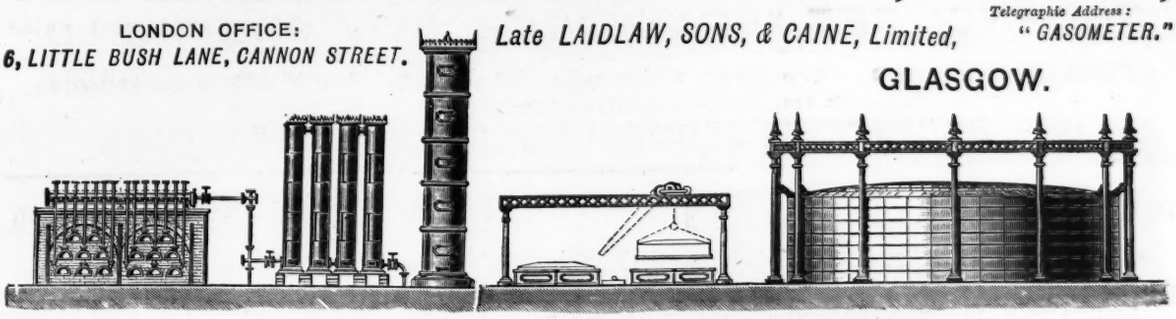

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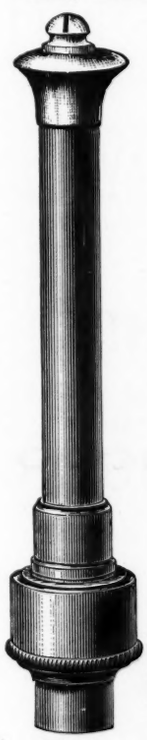

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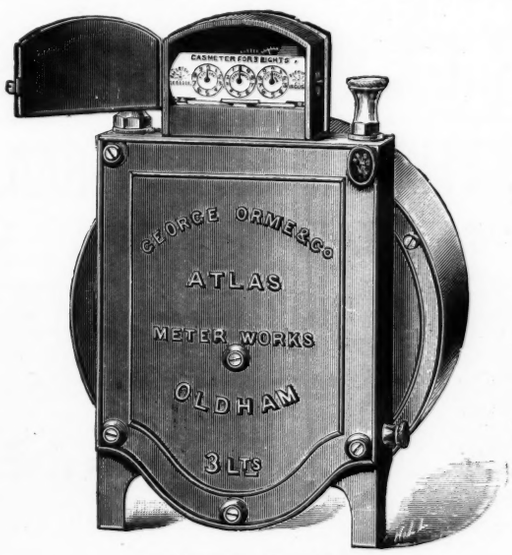

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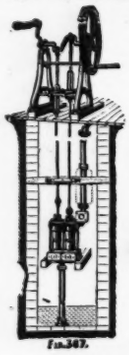

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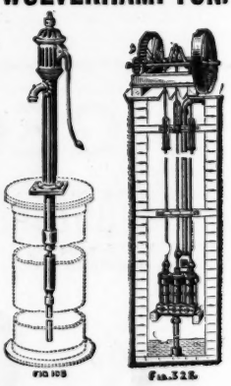

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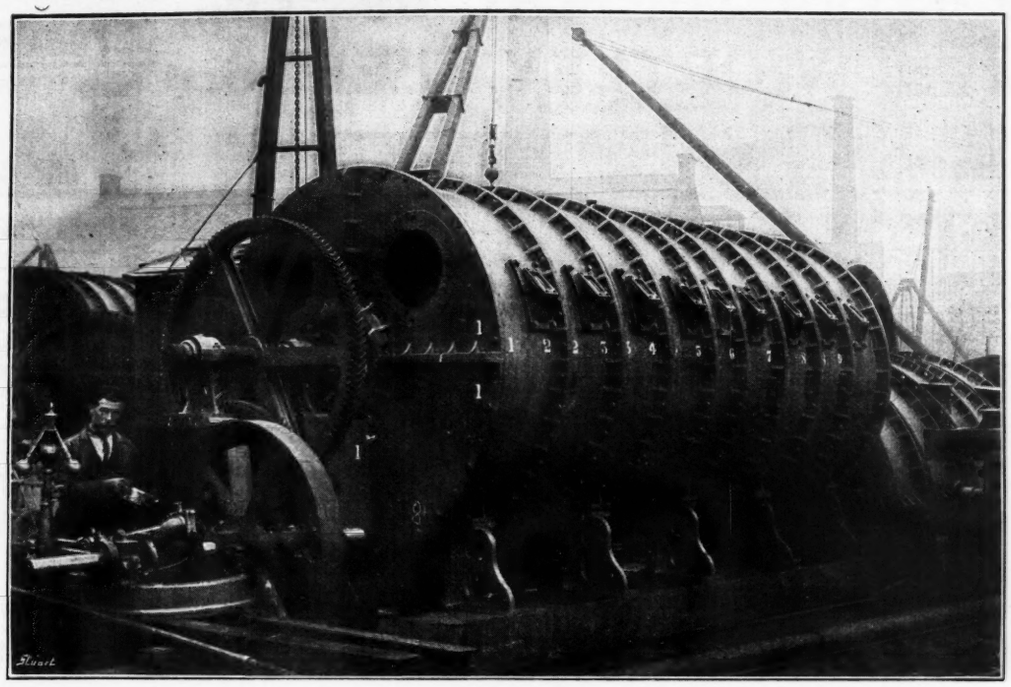

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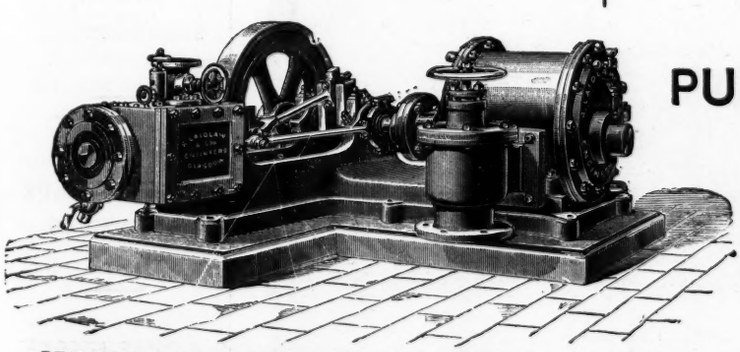

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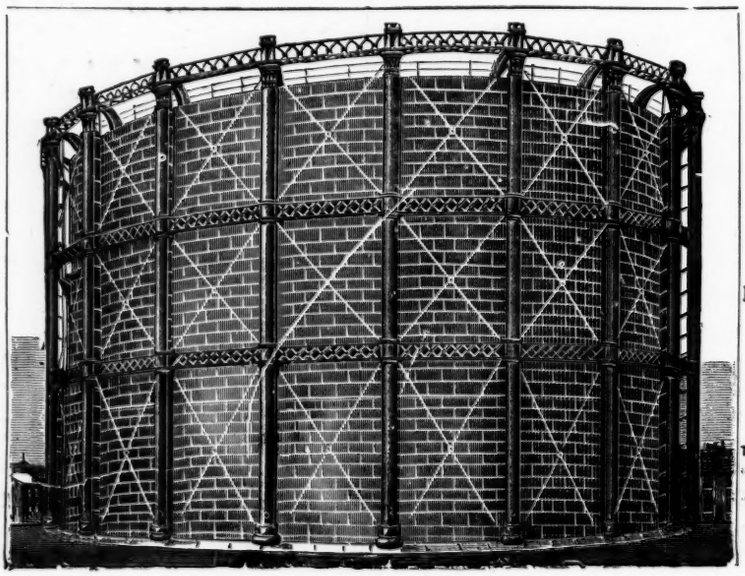

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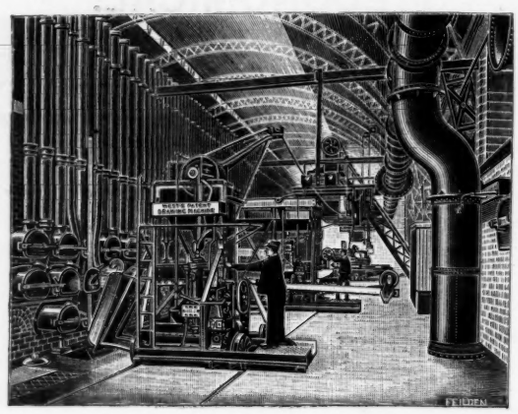

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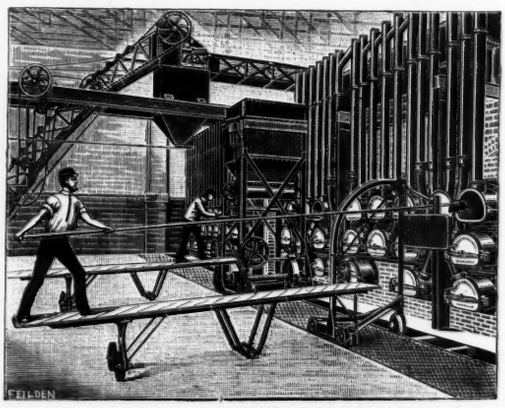

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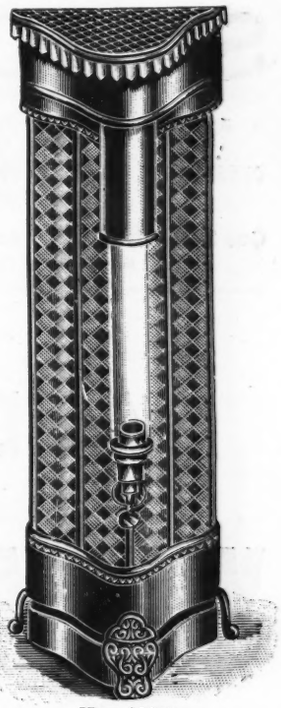

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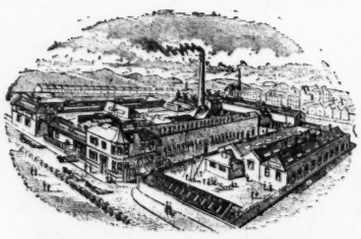

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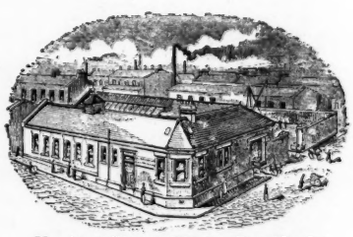

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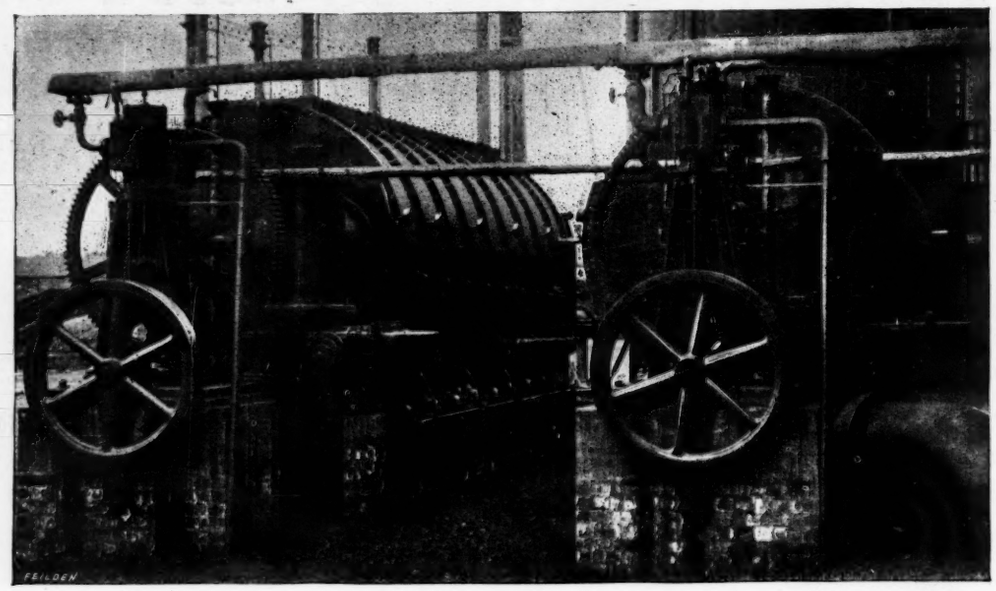

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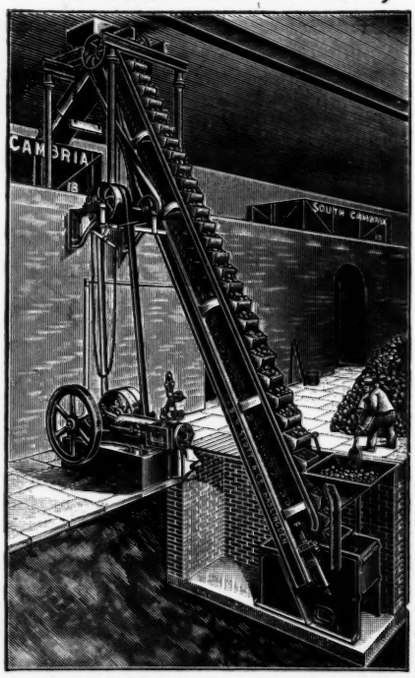

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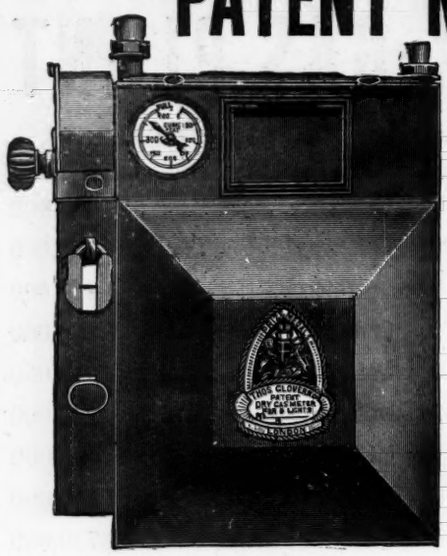

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EDITORIAL NOTES.

The Fall in Iron and the Coal Outlook.

WE touched briefly upon the coal situation last week, and should not have reverted to the subject so quickly had not events that have since occurred been so pregnant of hope for the future as to demand the attention of all concerned in the prosperity of the gas industry. We refer to the action of two of the leading bar-iron makers, which resulted in the issue last Thursday of circulars by all the principal merchants in the trade, reducing their list price of bars by £1 a ton, making a fall of 35s. in the month. This acceptance of what has for some time been the inevitable resulted further in a general reduction of prices in the iron and steel trades; the level now reached being on the average that of this time last year. This level is, however, still too high to induce business. In fact, the cutting down of prices has had an opposite to the desired effect; for it has made customers more cautious and reluctant to buy than ever. No one, naturally, will buy more than actual daily requirements until he feel assured that prices will not go lower; and the man who possesses such an assurance at the present time is not to be found, even among those most willing to be convinced—namely, the sellers. It is, indeed, candidly admitted that prices must come down further in order to meet foreign competition, "which is "more in evidence than it has ever been before."

The bearing of these facts upon the future of the coal trade is obvious. If, in order to secure orders (which are becoming daily more scarce), the iron trade has to largely cut down prices, one of two things must happen—either coal must come down in price as well, or the ironmasters must blow out their furnaces, as, indeed, some of them have already done. There were only 360 furnaces in blast in Great Britain at the end of September, as compared with 372 at the end of August, and 380 the year before. The iron (like the coal) merchants are beginning to realize that it is possible to kill the goose that lays the golden eggs. Gas managers will, we feel sure, not rush to their assistance, but will conserve their orders for mains and structural iron as closely as possible in order to help, not hinder, the fall in the present prices of these goods. The large orders for locomotives recently placed by the railway companies must, for the credit of the directors, be deemed to have been urgent, or the contracts may have had provisional clauses. Otherwise the policy of giving out the orders at present does not commend itself as the most wise. The contracts for cruisers just concluded by the Government will keep the Scotch trade from any absolute lack of business during the coming year, but will not have any marked effect in arresting the depression that is creeping over the engineering and iron trades in general. The downward progress of coal prices will in all probability not be so rapid as that of iron, and may be retarded by a spell of cold weather. But that it has begun, is very evident.

As is noticed in another editorial paragraph to-day, Mr. Livesey announced at the meeting of the Gas Companies' Protection Association last Tuesday that the Crystal Palace Company have been able to buy some additional coal at a reduction (as compared with contract rates) of 3s. a ton; and, although prices have not been officially marked down to any material extent, a good deal of quiet underselling is going on in the market. The situation is, in fact, causing no little uneasiness in the trade. Stocks all round are heavy; and deliveries to the London Gas Companies are, we understand, close up to, or in excess of, the quantities scheduled—a very different state of affairs from that which prevailed at the beginning of last winter. Collieries, too, are pressing forward contract deliveries, in order not to either accumulate coal at the pit head or stop work. Little casual buying of gas coal is being done, as few companies have run the risk of repeating their last winter's experience. As, moreover, the shipment of coal abroad is reported to be easing off—we shall to-morrow know more definitely to what extent, when the Board of Trade returns for October are available—and the great activity of Continental trade appears to have passed its climax and to be falling away, there is every prospect of a decidedly easier market in the spring, and of a gradual fall during the winter, unless the weather be very severe. As to that, who shall prophesy?

The Result of the London Borough Elections.

THE London municipal borough elections were held last Thursday, with the result, as is candidly admitted by the

"Daily News," that "the Moderates have swept the "board." There are many and substantial reasons why this result should be regarded with deep satisfaction by the public, as well as by ratepayers generally and the owners of public supply undertakings of all kinds. It is a sign, to begin with, that the monstrous pretensions of Progressivism are now being found out, and that London ratepayers are tired of being bled for the sustenance of "organized Labour," and of seeing all municipal institutions exploited in the interest of a class. Progressivism, as a classification in municipal politics, dates from the bad time of the first London County Council, when all manner of charlatans and busybodies of no importance foisted themselves into the new body by adroitly using the electoral organization of one political party, while professing to be superior to all considerations of party. They simply claimed to be pre-eminent in public spirit, and to have the monopoly of civic virtue. The bulk of the ratepayers were caught napping, and awoke to find themselves saddled with a set of representatives in local government with whose ideas they had no sympathy. Those reasonable men who did not happen to be Fabians, or Social Democrats, or Philosophic Radicals, or professional Trade Unionists, were forthwith dubbed Moderates by their triumphant opponents, who appropriated to themselves the more attractive name of Progressives. There is a good deal in a name; and by degrees this new-fangled classification in municipal politics spread over the whole Metropolitan government system, and also throughout the country. For a time, this trick of nomenclature rewarded its originators with power and popularity. "Progressive" was a name to conjure with; while "Moderate" was only just removed from being a term of reproach. As a keen critic of municipal politics has well observed, "no one would be satisfied with a "moderately fresh egg or a moderately honest servant." So, this time, the prejudicial label was discarded. The Progressives, unabashed as usual, were to be heard of in connection with Radical and Socialistic organizations; while the opposing candidates' cause was espoused by the Conservative and Liberal Unionist Alliance.

The practical effect of this manner of conducting the election is that the party convicted of extravagance, faddism, and truckling to Trade Unionism, has been placed in a minority in all but five of the new Borough Councils. Lord Rosebery's advice to the ratepayers to choose men of business and sound views of public duty, has been generally followed. The voters have rejected the appeals made to them to return only the candidates pledged to make municipal employment a Paradise for Trade Unionists, and have polled solidly for men who promised, first and foremost, to keep an efficient guard upon the public purse. Wherever Progressivism has been most rampant, there the rates have risen fastest; and the ordinary ratepayer has seen nothing in return for it. This observation has gone home to the average Metropolitan ratepayer at last; and consequently the very sound of Progress, in the municipal sense, frightens him to the poll in the opposite interest. The "Daily News" sapiently puts down the defeat of the Progressives to the "public-house" interest, which is one more example of that disinclination to look facts in the face of which we spoke last week as a weakness of one school of politicians. Progressivism has been cast out of the London boroughs because of its shortcomings and extravagant cost. While the rates have largely increased, the ordinary and necessary work of town management has not been better done. The streets are no cleaner, nor better lighted and paved, than when the rates were lower. If there is one thing connected with local self-government that impresses the ordinary citizen more than another, it is the continual rise of the rates and the portentous growth of local indebtedness, although rateable value is continually increasing also. The more people there are to pay rates, the higher the rates they have to pay. This is the gist of the whole popular view of the rating question. There is no "public-house" or "vested interest" influence about this deliberate judgment of the ordinary ratepayer. He sees local government outlay mounting faster than local resources; and he thinks it ought to be otherwise. For this reason, chiefly, he is giving his support to men who promise to look after the pence in local expenditure. He is persuaded that economy might be combined with efficiency in a degree that cannot be expected while the minds of those who hold the purse-strings are filled with grandiose schemes for benefiting the labouring class population solely; and he means to try to get his views on this matter carried out. This, it appears to us, is the moral of the London borough elections.

The Guildhall Conference on the London Gas Question.

THE Conference of Local Authorities convened by the Corporation of the City of London, to consider the question of the charges of the London Gas Companies, was duly held last Wednesday, at the Guildhall. The proceedings were formally opened by the Lord Mayor, who was succeeded in the chair by Mr. Alpheus Cleophas Morton, who, as our readers are aware, has of late years devoted to the work of the Common Council, and concentrated upon the Gas Question in all its phases, that meticulous attention which he once gave to the affairs of an ungrateful Empire in Parliament. Mr. Morton delivered himself of a smashing indictment of the Gaslight and Coke Company's administration of their great property—of course, contrasting it with that of the South Metropolitan Gas Company, which he reminded his auditory is "not a charitable institution." Naturally, the burden of his song was that one Gas Company ought to be able to do the same as another; and, if not, he wanted to know the reason why. Mr. Morton's speech was pointed at the end by reference to some very remarkable gas consumers' complaints. Mr. H. C. Richards, Q.C., M.P.—strange to find this name in such company—supported the object of the meeting. Mr. Trenner, of Holborn, endeavoured, without success, to improve the position he gained at the earlier conference of the London County Council. Mr. B. L. Cohen, M.P., spoke well and much to the point, as usual. His was the gravest pronouncement of all; and we prefer to leave his reported words to speak for themselves. Another serious speaker was Colonel Blair, of Paddington, who rightly protested against the insensate manner in which the London County Council have dealt with the Gas Question. There were, as a matter of fact, several sensible contributors to the discussion, who really knew what they were talking about. Others, of course, only aired their ignorance. We fancy there might be a Committee of thirteen or so, selected from among these delegates, to whom Parliament would be likely to listen in respect of the proposals of any future London Gas Bill. Perhaps it would not be a bad thing if the Companies themselves could confer with these gentlemen beforehand, and so find out exactly where the trouble lies. Sooner or later, *ex parte* proceedings come to a dead stand. Then a way to further progress must be opened by arbitration or war; and it seems a pity that it must always be war.

Gas Workers' Wages.

FROM different parts of the country intelligence reaches us to the purport that the Gas Workers' Union are moving again to get a general advance of wages for all descriptions of gas-works labour. We are not disposed to press once more in this connection the vexatious question of "recognition "of the Union." In works where this desire of Trade Union officialdom has been compassed, there is small probability of the rates of wages being determined by ordinary commercial considerations; but where labour is free, it will be for the employers who are asked to pay more to satisfy themselves as to how their employ stands in the market. In London, for example, about two years ago, gas stokers' wages were voluntarily advanced by the leading Companies, making this class of labour worth an even 6s. for an eight-hour shift. Naturally, at the time, credit for securing this advance was promptly taken by the Gas Workers' Union, who obtained some gratuitous advertisement, in a few newspapers, on this account. The fact of the matter was that prior to the advance stokers' wages had remained stationary for many years; while the pay in all the employments chiefly affected by winter hands—such as the brickmaking and building trades—had risen considerably. The turn of the labour market, that is to say, was against the gas manufacturer; and he had to raise his rate of pay accordingly. Up to, and including, the present hour, 6s. per shift has proved adequate to attract an ample supply and satisfactory quality of labour. There is no indication of the supply of suitable labour falling off in the London district; while there are certain good and definite reasons why it should continue to flow into gas-works throughout the kingdom. Unskilled labour in the building trade has been in less demand this year. The brick trade has been much depressed, especially in the Midlands. The increase of wages paid to colliers and iron workers in consequence of the inflation of these trades—now showing signs of collapse—which may be adduced as a reason for the movement under

notice, has no natural connection with gas stokers' remuneration. In the first place, wages in these trades are shifting. When trade is good, they go up; when it is bad, they fall. Gas-works labour, on the contrary, is not subject to these fluctuations. Wages may, and do, rise in gas-works; but they never drop. The bulk of the men employed in gas manufacture know this well enough, and are content to have it so. Besides, with the close of the war in South Africa, the supply of labour must increase. All this goes to show that where stokers' wages are proved to be sufficient to attract enough suitable applicants for employment, the demands of the Gas Workers' Union can be treated with the scant respect they deserve. There is no prospect whatever that unskilled labour will be generally dearer this winter than it is now. This being notoriously the case, the presumption of the Union in seeking to force a general advance in gas workers' wages is merely a piece of "bounce," which can only succeed by artificial aid. It has no justification in the state of the labour market; and without this foundation to work upon, no Trade Union demand for higher wages has ever borne fruit.

The Work of the Gas Companies' Protection Association.

THE third annual meeting of the Gas Companies' Protection Association, held under the presidency of Mr. G. Livesey, was attended by a small but representative group of supporters of the organization. The report submitted by the Secretary (Mr. F. E. Cooper) testified to the usefulness of the Association, particularly as regards the smaller Gas Companies; and the Chairman delivered a speech warmly commending the Association to the support of all Companies, who never know when they may need competent legal and parliamentary advice. It is satisfactory to learn that measures are actually under consideration for opening the Association to the smallest Companies at a low rate of subscription. There is money in hand at present; and as this state of things is not a necessary feature of the prosperity of the organization, it becomes a fair question how to extend its benefits at a smaller charge. As Mr. H. E. Jones remarked, the opportunity afforded by the meetings of the Association for ventilating in council the most important points of Gas Company administration, is worth more than the subscription. On the present occasion, an interesting discussion on local stock issues was raised on an inquiry by Mr. R. Hall, of Matlock. Some valuable information relating to the subject was given by the Chairman, Mr. William King, Mr. Charles M. Ohren, and others. Mr. Livesey also took the opportunity for publishing the comforting intelligence that the Crystal Palace District Gas Company have managed to buy some coal for the winter at a fall of 3s. per ton in the three weeks the bargaining lasted. It was assuredly worth going to the meeting only to hear this news.

Bradford Declines Municipal Collieries.

BRADFORD, having slept upon the proposal to apply for parliamentary powers to go into municipal coal mining, has thought better of it, and dropped the idea, though only by a narrow vote in the Town Council. The story is very instructive. Less than a month ago, the Bradford Corporation passed the resolution to apply for these powers, seemingly in a very light-hearted way. The portentous proposition was adopted as if it had been a mere question of detail in the ordinary work of the Corporation. Now, however, Mr. Williamson has criticized the suggestion in a manner worthy of the reputation of Yorkshiremen for level-headedness. He asked the Corporation to rescind the resolution, for weighty reasons which, one would think, ought to have prevented the majority of the Council from ever committing themselves to this "Midsummer madness" of municipal trading. He declared that no sensible man would talk about buying collieries just now. It is not a question of Municipalism, but of common sense. Two years ago, the Bradford Corporation Gas-Works used coal costing 8s. a ton. The present price is nominally 15s.; but a reaction has already set in, and probably in two years' time coal will be down to the old price. Meanwhile, on the top of this inflation of values, the proposal is made to buy the necessary collieries. This would mean a capital outlay for Bradford of at least £7,000,000, on the most moderate estimate. Where is the money to come from? Why buy collieries at the top price, and take all the risk of the value falling, as it can hardly increase? Mr. J. Triffitt followed on the same lines; but, for all this weight of reason, the foolish resolution was only rescinded by 31 votes to 29. This does not speak highly for the collective wisdom of Bradford, as represented in the Corporation. Eternal vigilance on the part of the wise men to be found in all cities would still appear to be the only safeguard against the democracy making a fool of itself. Suppose Bradford to be a seaport, would high freights be accepted as a sufficient reason for the municipality purchasing a fleet of colliers? It is high time the scales of an inflammatory Municipalism dropped from the eyes of local authorities generally. It is a good thing that the Bradford case was cured by an appeal to ordinary business considerations, without any reference to "principle." That is the best way to deal with these questions. Even the most confirmed municipalizer will shrink from the avowal that he would commit the ratepayers to a transaction which he would not enter into on his own personal behalf.

An Architectural Competition that Failed.

IT has been a stock grievance of British architects that the national and local government works departments have a habit of neglecting to take the advice of members of their profession in regard to the design of bridges and the laying out of new streets. There was a tremendous fuss made in professional circles over the circumstance that an architect was not joined with the Engineer of the London County Council for getting out the drawings of the new Vauxhall Bridge; and over and over again it has been preached in the editorial columns of the "Builder" that the disappointing character of much of the modern public work done in London and elsewhere is due to this habitual slighting of the architectural profession. The assumption at the back of all this complaining was, of course, that if public authorities only paid as much regard to architects as they do to engineers, all would be well. Unfortunately, this assumption, natural enough in the columns of the "Builder," is just what ample experience of the performance of British architects deters outsiders from accepting as an article of faith. Without attempting to frame an indictment against the profession as a whole, it is only too easy to show that, when implicit confidence has been reposed, on occasion, upon selected architectural advisers of public authorities, the result has been disappointing. It is to be feared that the latest experiment in the way of consulting eminent architects on the laying out of a great London street will not be regarded as a success. As all the world knows, the London County Council have in hand the making of a new street from Holborn to the Strand, involving a sweeping reconstruction of the whole region lying to the north of Somerset House. With a view to getting some expert guidance as to the most effective utilization of the new frontages and thoroughfares, the Council invited designs from eight architects who were paid £250 each for their work. There was no pledge to carry out anything. During the past week, all the sketches have been publicly exhibited; and, to the general surprise, many people went to see them. Our own interest in the subject is chiefly centred on the question whether, when it is made, the new quarter of the town will be as bright and easy to light as Paris and Berlin, or as tomb-like as the newly-built precinct lying between East Strand and the River Thames. Such public opinion as has found utterance respecting the plans, condemns them roundly. Even the "Builder" only utters the faintest of faint praise. None of the eminent architects has risen above "an "astonishing degree of impracticability," as one critic ably expresses it. The paramount requirements of light and air and business convenience are, as usual, to seek. Nobody affects to believe that this interesting competition is likely to result in anything practical. The money it cost has not been thrown away, inasmuch as it has exposed the weakness of contemporary British architectural art, and the impossibility of relying on it implicitly to rise to any occasion.

For the Secretaryship of the Birmingham Corporation Gas Department, which will be resigned by Mr. Edwin Smith at Christmas, there are 120 candidates.

Mr. George Laurence Gomme, the Statistical Officer of the London County Council, has been appointed Clerk, in succession to Mr. C. J. Stewart, who resigned a few months ago.

An interim dividend will be paid by the Singapore Gas Company, Limited, on the 10th inst. for the half year ended the 30th of June last, at the rate of 3 per cent. per annum; being at the same rate as that paid for the corresponding period last year.

WATER AND SANITARY AFFAIRS.

As the Local Government Board is the Department of State which includes among its multifarious duties the supervision of the Metropolitan Water Supply, a considerable portion of its annual reports, which increase in bulk as years roll on, consists of a record of the work of the two officials appointed under the Metropolis Water Act, 1871—the Auditor and the Water Examiner—who keep a watchful eye, on behalf of the public, on the Water Companies' operations and on the general condition of their finances. The twenty-ninth of the series, which has lately been issued, deals, as far as water supply is concerned, with the year ending Dec. 31, 1899; and though this period does not coincide in all cases with the Companies' financial year, the particulars given are none the less interesting. The portion of the report furnished by the Water Examiner (Mr. Charles Perrin, M.Inst.C.E.) is longer and of rather more general interest to our readers than that of his colleague (Mr. Allen Stoneham); and therefore it claims preferential notice. It is supplemented by an interesting "Memorandum" giving the results of the chemical and physical examination of the waters supplied by the Companies, together with six diagrams. As Mr. Perrin took up his duties in succession to Major-General Scott somewhat late in the year covered by the report, he admits that the information he furnishes cannot be based on personal knowledge, and that therefore it has been compiled from facts already on record, as well as from particulars obtained from officers of the Companies. These show clearly that there was no falling off either in the quantity or the quality of the water supplied to London in 1899. The population served on the 31st of December was approximately 6,020,845, as compared with 5,875,000 at the corresponding date in 1898, and the total volume of water delivered was 76,741,974,268 gallons, against 74,479,693,644 gallons in the previous year. Of the entire bulk, the Thames furnished 57·43 per cent.; the River Lea, 21·3 per cent.; springs and wells, 21·21 per cent.; and ponds (for non-domestic purposes), 0·06 per cent. Allowing for the increase in the number of people served, these proportions do not vary to any great extent from those for the year 1898; but the principal difference is on the side of improvement—the water derived from springs and wells being 21·21 per cent. of the entire bulk, as compared with 20·78 per cent. in the previous year. In fact, there has been, on the whole, a gradual increase in the quantity of water obtained from the purest sources since 1885, when it was only 11·16 per cent. The total daily supply was 210,251,984 gallons, for a population averaging 5,948,338; representing a daily consumption of 35·35 gallons per head and 238·05 gallons per house for all purposes, against 35·09 gallons and 236 gallons per house in 1898. The past year was a dry one; the rainfall being 12·4 per cent. below the average for the ten years 1870-79. On the 31st of December, about 93 per cent. of the houses in the Metropolis were on constant supply; and in 1793¾ miles of streets the mains were always charged. Mr. Perrin recognizes the efforts made by the Companies to render the water supply more efficient by connecting their systems of distribution at various points, so as to facilitate mutual assistance; and he gives particulars of the new works carried out during the year.

The figures already cited furnish evidence, we think, that the Water Companies have proved themselves to be equal to meeting all the demands of the consumers. A supply of nearly 35½ gallons of water per head of the population for all purposes, or 28¼ gallons for strictly domestic uses, surely cannot truthfully be called inadequate. Nor is its quality such as to justify the opprobrious terms applied to it by certain public speakers who persistently contemn the reports of chemists of the highest standing. This is amply shown by the "Memorandum" to which reference has already been made. The Local Government Board sustained a double misfortune last year by the loss of Sir Edward Frankland almost simultaneously with the death of General Scott; and consequently the reports on the chemical and physical examination of the waters supplied to London emanate from three sources. Those for the first seven months of the year were, as usual, by Sir Edward Frankland; those for August and September, by his son, Dr. Percy F. Frankland, F.R.S.; and the rest by Dr. T. E. Thorpe, F.R.S., who succeeded to the position held for so many years by the above-named distinguished Chemist. Under these circumstances, no general report could be made to the Board on the examinations; and therefore the "Memorandum," which is based upon the monthly reports, was prepared in the Department. It is gratifying to find that its compilers have been able to vindicate the Metropolitan Water Supply from the aspersions freely cast upon it. It is pointed out, at the commencement, that the only chemical impurity of any consequence is organic matter; and the second of the diagrams given, in which the raw Thames water at Hampton is compared with the average filtered water as delivered to the consumers, demonstrates how great is the chemical improvement effected by the Companies' operations. Unfortunately, the Board were not in possession of the information necessary to enable them to carry the curves on the diagram on for the last three months of the year. Another striking diagram is that referring to the Lea. It shows that, except in January, February, and November, the water delivered by the East London Company was "uniformly of excellent chemical quality." A further diagram gives proof that the New River Company's supply was, for seven out of the first ten months of the year, substantially "of the chemical character of excellent spring "water;" while for four months it was "even better than "the average of the deep-well waters." Let us see what improvement has been made in this respect during the past thirty years. Taking the mean proportion of organic matter contained in the Thames water delivered in 1868 as 1000, the figure in 1899 was 818. Applying the same standard to the Lea, the figure, which went up from 484 in 1868 and 618 in 1869 to 1013 in 1880, was 566 in 1899. The water from that river delivered last year, therefore, was, in respect of organic purity, of fair average quality. Mr. Perrin reports, however, that the year 1899 was, on the whole, favourable for the filtration operations of the Companies supplied from these rivers. This testimony to the character of the London Water Supply may be left to the consideration of those members of the new Borough Councils who contemplate making a bid for cheap notoriety by abusing the Water Companies, and depreciating the commodity they sell.

Turning to Mr. Stoneham's report, we find that the rates of dividend paid by the Companies last year were, with the exception of the East London Company, either the same as, or slightly higher than, those for the previous twelve months. The total amount received by the Chamberlain of London, up to the end of 1899, under the operation of the sinking-fund clauses in the Acts of the East London, Lambeth, and Southwark and Vauxhall Companies, was £35,793, of which £35,312 has been employed in the purchase of stock for the ultimate extinction of the Companies' capital. The Official Auditor's relations with two of the Companies were not of the most harmonious character last year; and he sets forth the points on which difficulties arose. A sum of about £3550, expenses incurred by the Companies collectively in connection with the investigation and verification of the books of reference and plans deposited by the London County Council in respect of the London Water (Welsh Reservoirs and Works) Bill, and the procuring of evidence of non-compliance with Standing Orders in the case of the petition for the Bill, is specially singled out by Mr. Stoneham for objection, on the ground that the Companies had "no "direct interest in the lands and water rights proposed to "be taken." With all respect, we submit that they had a very direct interest in opposing *in limine* the measure referred to, forming as it did a portion of a gigantic scheme which they conceived, and which Lord Llandaff's Commission have since declared, to be unnecessary. However, the Official Auditor was advised that the Companies had no right to be heard at the initial stage; and therefore he deemed it to be his duty to take the necessary steps for giving them an opportunity of appealing to an arbitrator on the matter. The Auditor's objection will scarcely hold good in the case of similar expenditure in connection with the Bill which the London County Council will be asked by their Water Committee to promote at their meeting to-day; its single object being, as shown by the report which appears elsewhere, to sanction "the purchase by the "Council of the undertakings of the eight Metropolitan "Water Companies." In this measure the Companies certainly cannot be said to have "no direct interest."

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 1161.)

THE Stock Exchange had another dull period during the week just closed. To begin with, business was, of course, a good deal handicapped by the triumphal entry into the City of the C.I.V. on Monday. Then, Thursday was an annual holiday, on which the Exchange is always closed. This left two disjointed breaks of two days each to represent a week's work. There was scarcely time to develop any marked tendency; and business continued dull, flattish, and generally devoid of interest. Prices for the most part are down; but the drop everywhere was only of inconsiderable magnitude. Perhaps when the American election and our own Cabinet arrangements have been got over, the markets may grow livelier and firmer. There was nothing of importance to note in the Money Market beyond a quiet, firm attitude. Changes now-a-days are swift and sudden; but, without venturing in the dangerous field of prophecy, it may be said that the 4 per cent. Bank rate, now nearly four months old, looks as if it were going to last a bit longer. Business in the Gas Market was certainly not so quiet as it had been the preceding week; but still it was not active. On the first day or two, there was very little doing; but Wednesday and Friday redeemed the week from a position of threatening stagnation. But there was almost absolute stagnation in values. A couple of minor issues had a slight advance, and none receded; but all the leading issues were marked continuously at unchanging figures, never ranging off the line more than a fraction either way. Thus, Gaslight ordinary was done every day at 99; and sometimes a fraction above or below that figure. The secured issues did nothing to speak of. The South Metropolitan price was 130½—once only varying to 130¼. Commercials were hardly noticed—one transaction in the debenture being the total. Next to nothing was done in the Suburban and Provincial group; but Crystal Palace had a rise of a couple of points. The Continental Companies were as quiet and as level as the rest; but Imperial Continental debenture improved a point. There was no incident among the remoter undertakings. Among the Water Companies, business was much the same as usual; and the tendency to improve in value which recently showed itself continued by a few moderate advances.

The operations of the week showed that only on one day did Gas quotations make a move; Crystal Palace advancing 2, and Imperial Continental debenture 1 on Friday. In Water, on Monday East London rose 1, and Grand Junction 1½. On Tuesday, Southwark ordinary rose 2. On Friday, East London debenture gained 1, and West Middlesex ½. On Saturday, New River fell 2.

ELECTRIC LIGHTING MEMORANDA.

Why Local Authorities Shun Depreciation of Electric Lighting Plant—Example of the London County Council—Free-Wiring as a Bribe to Municipal Electors.

THE wilful blindness of local authorities to the necessity of providing for the depreciation of electricity supply plant seems to be incurable where the profits of the undertaking do not pay working expenses and the first capital charges of interest and sinking fund. That is the sum and substance of the matter. While it remains imperatively necessary, notwithstanding most complaisant book-keeping, to draw upon the rates for keeping the concern going, municipal electric lighting committees cannot bring themselves to ask the ratepayers of the present to hand over something extra to provide for the future. The position is quite intelligible, and (human nature being what it is) excusable. Nevertheless, the trick of living upon capital is bound to land those who practise it, or their successors, into difficulties hereafter. One of the ugliest workings of municipalism under this policy of make-believe is the constraint put upon public officers, who know better, to back up the false pretences of their committees. Many municipal electrical engineers in all parts of the country are found writing reports, or making statements in the local newspapers, to protest that they do not want any depreciation fund. It is scandalous; but these officials cannot help themselves. Perhaps some strong local critic of the corporation finds this hole in the electric lighting accounts, and draws attention to its existence by a letter to the leading local newspaper. The committee know that not one of their body is able to rebut the allegation; and consequently they put up the electrical engineer to do it. This kind of municipal cowardice is far more common than would be believed. Few municipal electrical engineers are strong enough to stand on the ground that their duties do not include the defence of the finance of the committee in the public Press.

It would be invidious, as it certainly is impossible, to keep the track of all municipal tricks of the kind; and therefore we judge it sufficient for the time being to remind all local authorities having indebtedness on account of electric lighting, of the very sound and unmistakeable practice of the London County Council, acting in conjunction with the Treasury, with reference to the electric lighting loans of Metropolitan local authorities. Poplar, for example, applies for a loan of £25,000 on account of the electric lighting of the parish. This happens to form part of a very much larger capital amount; but the whole of it is advanced on the same terms—namely, on the instalment system for 42 years, at 3½ per cent. The condition attached to this advance is that the Council will decline to sanction the raising of any loan to replace any of the plant and machinery during the currency of this loan, and will expect the borrowers to provide for all replacements and renewals required during that period (of 42 years) out of a sinking fund to be provided for the purpose, or from maintenance account. This ought to settle the question of the necessity of a depreciation fund. It is not that the Council are solicitous merely for the repayment of the loan. This is duly provided for, by the agreement that a rateable proportion of the total is to be paid back annually, on a fixed date. What the Council say besides is that the plant purchased out of the advance must be kept up out of revenue. This is not merely an obligation to repair, but also to renew. It is not too much to say that there are few local authorities' electricity undertakings in the kingdom that could replace a boiler or a dynamo out of revenue. The solvent ones, naturally, pay into a depreciation fund as a matter of course. Their only care is to ascertain what is a fair and proper allowance. The insolvent ones simply pretend that nothing of the kind is necessary—apparently unsuspecting the fact that every such undertaking that has no adequate depreciation fund stands thereby confessed of insolvency.

We are very glad indeed to notice that the "Electrician" utters a timely protest against the pandering of some candidates for election to the new Metropolitan Borough Councils, to the artizan voters, by promising free wiring and penny-in-the-slot electric meters at the public expense. This has been done rather largely in those Metropolitan districts where the local authorities have been "Progressive" enough to launch into electric lighting. As our contemporary observes, no exception can be taken to the working classes having electric light if they want it, or to their having it as cheaply as it is equitable to supply it. "But the terms in which these electoral addresses are couched reveal only too plainly the class prejudices to which they appeal, and convey the impression that whoever else may pay dearly for electricity—whether the well-to-do consumer or the ratepayers—the working man shall have it dirt cheap." This is obviously an electioneering promise of the "*panem et circenses*" order; and respectable politicians of every party ought to be above bidding for popularity in any such mischievous fashion. It reminds us of what we recently had to say in this column about the Poplar performance. These Progressive gentlemen, who thus offer bribes to the populace, would doubtless resent being likened to the Great Tempter; but they resemble him in at least this remarkable point—the bribes they offer are things which do not belong to them. One could understand a downright bid of five shillings a vote, or thereabouts, payable out of the candidate's own pocket. Such a way of bribing is at least honest and aboveboard. But our Corrupt Practices at Elections legislation will be a dead-letter if persons of advanced views of such matters are allowed to offer boons to people whose poverty appears to render them amenable to influences of this kind—boons to be provided in the long run at somebody else's expense.

INCANDESCENT GAS-MANTLE COMPETITION.

THE article in last week's issue on the subject of gas-mantle competition and prices has received complimentary attention, and from no quarter has there come a note of disapproval. It is not intended to pursue the discussion of the general question to-day; but we may say that we shall watch heedfully for, give careful consideration to, and keep our readers apprised of, any evidence which points to the time when the gas manager and the gas consumer will be able to go openly and purchase, without fear of any unpleasant consequences, good mantles at a reasonable price—say, 4s. or 4s. 6d. per dozen. We do not give this as the ultimate or lowest figure at which progress in invention and knowledge may enable makers to profitably work; but it is mentioned as we have present incontrovertible evidence in England that mantles of quality can be put on to the market at that price, to the benefit of both producer and user. No one respects legitimate patent rights more than we do; but it frets one to see an unconscionably large capital, built up by various agencies in the past, causing any sluggishness in the advance of the system of lighting upon which the gas industry has centred its hopes, and stunting the growth of offshoots from the chief arteries in which progress has so far been effected.

We are merely reverting to the subject this week for the purpose of calling attention to two matters which have a direct connection with the competitive aspect—in the one case competition is, we are told, already active, and in the other the seed has been sown, but whether it will grow and be fruitful it is impossible to foretell. We will refer to the latter first. Incidentally in last week's article, we mentioned rumours which had reached this office of a new Company which was being formed for the purpose of introducing a mantle to be known as the "Standard." This Company was lifted from obscurity within the past few days by the publication of news as to its registration. It is proposed that the new concern shall have a capital of £60,000 in £1 shares; and the patents which it is intended to acquire and work are Nos. 2000 and 15,500 of 1896. Extracts from the specifications of the inventions were published in the "JOURNAL" for May 5 and October 27 of that year. The birth-place of both was Berlin; and the first bears the name of

C. Kortwich and the second R. J. Eiffe—this being a communication from F. Meyer and Co. Until we have a closer acquaintance with the mantles made under these patents, we cannot give any independent information about them; and readers who are impatient for precise knowledge as to their constitution must in the meantime be referred to our abstracts of the specifications in the issues of the "JOURNAL" already mentioned. Writing without investigation, there are about both mantles points which have the appearance of novelty. Herr Kortwich in his mantle aims at combining certain substances, possessing, on the one hand, a crystalline structure, and, on the other, the property of not readily entering into combination with the bodies contained in atmospheric dust—the mantle constructed according to the invention being, it is said, characterized by a high degree of firmness, illuminating capacity, and resistance to external influences. The researches of the patentee of the second invention to be acquired by the Company have demonstrated to him the following principle on which the luminosity of incandescent light depends: The oxides of certain elements are capable at high temperatures of taking up oxygen, and of yielding the same again; and thus, in the presence of reducing gases, or the like, of converting themselves into lower oxides, and on the subsequent access of oxygen again absorbing the same. All these bodies are designated "oxygen conveyors." The patentee illustrates his points fully in the specification; and, by following his prescription, he claims that a compound of "very good power of resistance and hardness" is obtained, which, on being exposed in the finished product to the outer surface of a non-luminous flame, emits an "intense light"—the combustion is intense, and the temperature is considerably increased. A pronouncement as to whether these patents are, or are not, anticipated by the Welsbach or any others is beyond ordinary mortals like ourselves; and to experts and lawyers we gladly resign the task of wrestling with the perplexing problem until they, or higher arbiters, solve it to the satisfaction of one or other of the parties. But if we may make use of Cowper here, we would say that these incandescent mantle questions appear to present

> "Knots worthy of solution, which alone
> A Deity could solve."

Whoever comes into the field does so with full knowledge that their competition will be contested step by step by those already in possession; and preparation must be made accordingly.

Correspondents have been encouraged by last week's article to call attention to certain productions in which they are interested having a more or less intimate relation to the subject under notice. But we would point out that in our last article we steered altogether clear of the question of burners—confining ourselves entirely to that of cheaper mantles. Burners suitable and unsuitable for incandescent lighting, and at all prices, can be obtained in almost every town; and there is no bar to using on them mantles which in days past have maintained a legal status, and upon which there is no "limited license." The free competition in them will ensure that users are fairly treated; and therefore we do not see that anything would be gained by opening up a fresh question on that line. One correspondent calls attention to a bye-pass arrangement which he invented a few years ago for incandescent burners. But that has a very remote connection with the present subject; and, moreover, we find that the invention was described by us at the time the patent specification was issued. Perhaps the most interesting communication which the article produced was from the Birmingham Incandescent Lighting Company, Limited, who sent us a complete incandescent light which they sell in quantities of a dozen at the low price of 1s. each. Of course, there is not, and it can hardly be expected that there would be, that high-class finish about the burner which one gets with higher priced goods; and, as to the mantles, unfortunately those forwarded were damaged in transit, so that we cannot speak either of their efficiency or strength. But our correspondents assert that the mantles are not infringements of the Welsbach patent of 1893, "even supposing that document to be of any value," as they contain absolutely no oxide of cerium or uranium. The mantles, the Company inform us, are being retailed at 6d. each, 5s. a doz., or 50s. a gross—the last figure being "generally reduced to 48s." We give these prices not for the purpose of advertising the mantle, but solely as a point of interest for readers. The last figure shows that, for large users, the fourpenny mantle (if serviceable) is an accomplished fact in Birmingham. In the concluding paragraph of the Company's communication, they write: "These mantles are being used by the Birmingham Corporation and Board of Guardians; and this is not by any means the only Corporation which has adopted our mantle. . . . Trade with us is simply flourishing." This looks like active competition. In giving this information, however, we should like it to be clearly understood that we are not commending this burner or the mantle. We reserve our right in all these matters to commend or to condemn after trial; and this, we regret, through the accident of the mantles being fractured before their arrival, we have been unable to give in this instance. Nor can we state the manufacturers' own figures regarding the illuminating power and the consumption of gas, as they were not furnished. But the complete light can be obtained at such a nominal figure that many gas managers may be disposed to test it on their own account. For a cheap incandescent light, the prepayment meter system has created an opening the extent of which is beyond measurement.

MINERS AND LAWYERS ON THE COMPENSATION ACT.

THE Workmen's Compensation Act recently underwent criticism by the representatives of two large classes of society interested in its working—the Miners' Federation of Great Britain and the Incorporated Law Society—and suffered little damage therefrom. Indeed, Mr. J. H. Cooke, the President of the North Wales branch of the latter Society, who read a paper dealing at length with the (1) Home Office report, (2) statistics furnished by a large Insurance Company, and (3) the decisions of the Court of Appeal under the Act, had nothing but good to say of its effects. With the statistics published by the Home Office, and with many of the appeals, we have already dealt in these columns; but the figures given to Mr. Cooke by the Ocean Accident and Guarantee Corporation are of considerable interest and constitute a new contribution to the somewhat meagre fund of reliable information available as to the working of the Act.

The Insurance Company referred to informed Mr. Cooke that they had issued policies covering the risks attached to employees earning over 80 millions sterling per annum—that is to say, something more than a million hands; and that, since the Act came into force, rather over 100,000 accidents had been reported to them, of which 1700 had terminated fatally. As probably these policies did not all commence so soon as the Act came into force, it may be said that this Company alone dealt with 50,000 cases of accident in the course of a twelvemonth. The Home Office estimate of 150,000 accidents in all occupations affected by the Act is, therefore, obviously within the mark. Yet only 999 cases, or about half of one per cent. of the total, were actually adjudicated upon in the Courts in 1899; and only a fraction of these could be classed as disputes—many being merely in the nature of friendly arbitrations. The cry that the Act breeds litigation, so frequently raised by those who love not the handiwork of Mr. Chamberlain, looks rather ridiculous in the face of the facts that are coming to light as time goes on. No wonder that Mr. Cooke, differing from some of the legal luminaries who think fit to air their views of the Act from the Bench, declared that, considering the Act to be a novelty in legislation, it had so far worked very satisfactorily, with a minimum of litigation, and had not proved to be a serious financial burden. He added that it had a general tendency to prevent pauperism, as in many cases the workman who was totally disabled would have to go upon the parish but for the compensation provided for him by the Act: "To the honest disabled workman, who hated the workhouse, the Act had been a ray of light and joy."

In the same strain spoke Mr. Parrott, one of the Yorkshire delegates to the Miners' Federation. He said that, "in many cases, the Act had been a perfect blessing." The chief amendment urged by other of the speakers on the subject at the Federation meetings, was one to extend the benefits of the Act to every worker—a proposal which, as we have before now pointed out, is by way of being a compliment, not a commination. The only other proposal of any importance for the amendment of the Compensation Act that was made at the miners' conference, was one to petition for the abolition of "contracting out." Upon this point the men seemed to have some curiously inaccurate notions; one being that, if a mutual scheme (quite erroneously called a "contracting-out" scheme) be certified by the Registrar of Friendly Societies, all the employees are compelled to accept it. Yet it is one of the principal conditions that must be fulfilled by any mutual scheme before it can be allowed to pass Mr. Brabrook, that it shall not contain any provision making it in any degree obligatory upon any man to become a party thereto.

Another wholly inaccurate idea that appeared to possess the speakers, was that a scheme certified by the Registrar could be, and in some instances was, deliberately less favourable in its terms than the provisions of the Act itself. One speaker at the conference said that, "as an instance of this, he would quote a case where a man was killed, and his widow received £90 as compensation. One-half of this sum, however, was contributed by the workmen themselves; whereas, if there had been no contracting-out, the widow would have been entitled to £300 compensation, all of which would have come out of the pockets of the employers." We wish the speaker had quoted the employment in which this scheme is in force. It would then have been possible to refer to Mr. Brabrook, when we should without any doubt have found that by its terms many substantial benefits outside those granted by the Act—such, for instance, as payment from date of injury, free medical attendance, or a higher rate of compensation in case of temporary incapacitation—were provided; and that the contribution of the employers was fully equal to their liability under the Act. The statement made by the delegate was doubtless the product of ignorance, and not malice; but a more misleading idea of the operations of a mutual scheme under the Act could not well be conveyed. If a chosen representative of the miners is so ignorant of those operations, and of the decided benefits accruing from the adoption of such schemes, it is little to be wondered at if they are unpopular with the rank and file.

No other criticism of the Act could be found to be made by the Miners' Federation, and what that was said by way of criticism is there that weighs aught against the first remark we quoted—"in many cases it has been a perfect blessing"? It may truly be said that the Workmen's Compensation Act is justified by its critics.

THE SCIENCE OF GAS MANUFACTURE AND OTHER THINGS.

In a recent issue of the "Engineer," there appeared an article professing to deal with the subject of Works Management, as a branch of a general discussion of Foreign and English practice in electrical and technical industry. Perusal of the article quickly reveals the interesting fact that the writer has very little to say on the subject of the management of works, but a good deal to advance, that certainly needed saying, about the whims and oddities of the men of science, the technicians, and the workpeople of his country and time. We follow his pointed, occasionally stinging, observations here, because some of them have considerable bearing on certain recent statements of our own respecting the barrenness of British gas engineering, and the paucity of aspirants for distinction in this avocation.

Speaking of German works offices and their occupants, this candid critic of his countrymen and others makes bold to declare that the German engineer is, as a rule, better informed concerning what is going on in the world than the average young Englishman. Among the most striking of the things he notices in a German works office—apart from the polished parquet floor and clean and orderly look—are the "files of technical periodicals." The German is not always inventing and scheming things out of his own head. He is careful to know, to the very smallest detail, what is being done by every other engineer all over the world. "He reads French, English, and even American with ease. He carefully weighs the merits of various novelties, and quietly produces slightly improved versions of the best of them, without the expense or anxiety of working them out from the beginning." That is what makes the German such a thorn in the side of the original inventors of other lands. He is no believer in the old English fashion of keeping shop only in specialities. Unhappily, this fashion is not yet obsolete in England. We still have manufacturing firms whose goods are all patented, in consideration of which they are usually half as dear again as they might be. The perception that over-patenting is as bad as over-advertising, makes headway slowly in England and America. In Germany, on the contrary, the superstitious belief in the superiority of patented and much-advertised articles is not generally held. You will not persuade a German to pay a fraction more money for a cake of soap that is advertised everywhere as being the best, than the price at which any other satisfactory make of a similar sort of commodity can be had across the counter.

On the other hand, foreign workmen are, if anything, rather more disposed than English workmen to swallow the fallacies of Socialists, Communists, and Anarchists. Consequently, British engineering trade is protected not a little by the existence in this country of this superior political intelligence on the part of the working people. Our working folk are given to striking on small provocation, or none; and they—or the Trade Unionist contingent of them—believe as firmly as the Continentals in the iniquity of capital, and all the other economic garbage of Social Democracy. But the real liberty, and freedom from over-government, enjoyed by the English working man save him from falling into the worst political blunders of his foreign compeers. Besides, neither the English engineer nor his workpeople take their industrial and political affairs so seriously as foreigners do, when they think of these matters at all. Cricket and football are powerful social antiseptics; and such causes as Anarchy cannot co-exist with them.

It appears that English engineering in general shares with gas engineering the complaint of a lack of competent young men. Gas people have been under the impression that the electricians must be getting them all; but, according to this writer, it is not so. Then where are they? Can it be that our elementary and preparatory educational system does not produce them at all? It is remarked that most of our young electrical engineers come from technical colleges; and it is flatly declared that they are not of much use. The critic goes so far as to say that the colleges had better confine their teaching to principles only, with just a skeleton of their application to practice. "Mathematics, electricity and magnetism, chemistry, thermodynamics, and so on, can best be learnt at college; and college teachers are more competent than anyone else to teach such subjects. It is, therefore, false economy for them to try to teach practical work, of which they have only a second-hand knowledge, suffering from a very serious time-lag. The teacher of electrotechnics, or any other technology, always misses the most important factor of all—namely, price. There is no difficulty in designing an engine or a dynamo; the problem is to design one that will do as well as others and cost less." This criticism, pushed to the logical conclusion, would destroy so-called technical colleges altogether; and one is not sure this would not be the best thing. It would not be necessary to condemn young people, thirsting for knowledge, to the old mill-horse round of classical and mathematical studies. There is aplenty for them to learn, without exceeding the bounds of pure preparatory teaching. How hopelessly astray the British technical college system has gone, is proved by the ridiculous figures cut occasionally by their heads, when they try to lecture and write to the papers about matters of business more or less connected with their science. The professor, roaring from his chair, is often taken, outside the college, for another animal.

The candid writer goes on to declare that "a great deal of harm is done to technical progress in this country by scientific cant." Fortunately, this country does not suffer alone from the evil, which is particularly rampant in France, where the Academy of Sciences gives it its best encouragement and highest expression. Scientific cant is the abnegation of utility and the avoidance of application in the pursuit of experimental research. Nothing that is technical can be scientific, according to this order of thought. "If you experiment with 37 grammes of steel in a Berlin porcelain crucible, or especially in a tiny electrical furnace, with a standardized platinum pyrometer and a spectroscope, you are doing scientific work; but if you work with a ton in a converter, that is merely technical—though you will be patronizingly told your work may throw some light on scientific questions." Technicians are quite accustomed to be told that their work is altogether inferior to pure science. It is quite refreshing to find somebody who knows what he is talking about "going for" the men of so-called pure science, and telling them that the true order in these things is the other way about. "One kind of knowledge is not purer than another. What is called pure science is really merely the raw material; and the raw material has to be worked up by the engineer for the use of man. Which is higher—the raw material or the finished product? In the case of ordinary raw material, such as iron, it is produced intelligently, with the view of being worked up—that is to say, it is produced for a given purpose. The scientific man does not work intelligently in this sense. He produces raw material without knowing or caring whether it can be worked up, just as the insect produces silk. If anything, he prefers what cannot be worked up."

The gas industry has suffered much from this same canting science, whose professors have called it crude, unscientific, and wasteful. They would be puzzled to name an industry in which so little is wasted. Young men taking to this industry need not be ashamed of its science, when they meet their compeers at the door of the professor's lecture theatre. The truth is that of the greatest science of all, the science by which civilization lives—the science of getting the most for the money—the Professor is usually a child, outside the question of his own fees. For, as the writer in the "Engineer" observes, to the cant of science is generally added the hypocrisy of making believe that the man of pure science has nothing but love of science for his motive and his reward. Yet, somehow, when advice upon a mere point of technique is wanted by Government or any other power—when a water supply is to be pronounced upon, or a referee is to be named for settling questions of town's gas-testing—the men of pure science rarely despise the appointment, however little they may know about the business.

Of course, the world wants all the science there is, and more. It also needs all the technical knowledge, and all the common-sense and commercial activity that can be brought to bear upon its business. The great point to be remembered is that science, as pure as may be, in the sense of exact knowledge, is not a thing apart from the concerns of everyday life and work. It is really but another name for the true inwardness of phenomenal knowledge. Not all science is immediately applicable to technics or commerce. The mere utilitarian judgment of science is a heresy; but while science may not always be useful, nothing that is practically right should be demonstrably unscientific. When this appears to be the case, we may begin to suspect that our science is defective, or wrong. Our contemporary, whose views we have followed with appreciation, makes one small slip in an otherwise sound and inspiring argument, in asserting that the idea is that if a scientific man finds out a new phenomenon he should read a paper on it; but it is beneath his dignity to take out a patent for it. This is not quite the way of it. Many scientific men have taken out patents, for patentable inventions. But the glory of a man is to make a discovery. Men go to the ends of the earth, and scale the mountains and plumb the seas, with the object of discovering something. So in the world of phenomena, the man who discovers a thing does not patent it. He could not, if he would. Some men are so wedded to the search for the undiscovered, that they heed nothing else. But are they necessarily more scientific on this account than other men who apply their powers to the intelligent carrying on, say, of a gas-works? Subject, in science as in art, is of no moment. The spirit and the method alone determine the quality of work; and therefore the man who, of set purpose and by rational means, gets the utmost return from a ton of coal, is as truly a man of science as he who determines the value of the Clark cell to seven significant figures. Wherefore, let not the latter set himself up to judge the former, as he is too often tempted and encouraged to do.

The Torquay Town Council last week decided to pay Mr. Ingham, their Water Engineer, £125 for his extra services in connection with the purchase of the watershed, and £20 for those rendered in the matter of the extension of the borough. It was stated that the watershed question had involved the preparation of 150 plans.

The Russian Minister of Finance has decided to introduce the metric system on the 14th of January next in St. Petersburg, Moscow, and six other large cities within the Empire. The rest of the country will gradually be brought to use the system during the course of the next five years, by which time it is believed the whole of Russia will have adopted it.

WATER, CORPORATION, AND ELECTRIC POWER ACTS OF 1900.

(*Concluded from p.* 1079.)

The following Local Authorities' Acts are of a general character, but contain references to authorized water and gas works.

The Barnsley Corporation (Water) Act, as its name signifies, relates to water supply exclusively; but it is of a peculiar character, and differs materially from ordinary Water Acts. It empowers the Corporation of Barnsley to make deviations in constructing certain pipe-lines authorized by their Act of 1896; and confirms certain agreements entered into by the Corporation with the Corporation of Sheffield, who have concurrent rights over the Don watershed. A reservoir on the Knoll Brook which the Sheffield Corporation were authorized to make will now be constructed by the Barnsley Corporation, within an extended period of time.

The Bradford Corporation (Tramways, Gas, and Various Powers) Act sanctions the acquisition of scheduled lands required for the protection of the drainage area. An agreement between the Corporation and the North Bierley Gas Company, for the purchase of the undertaking of the Company, is scheduled and confirmed. Outlying portions of the undertaking may be purchased by the local authorities interested. The price of gas in Cleckheaton is not to be more than 10d. per 1000 cubic feet above that charged for the time being within the city. Additional water and gas capital is to be borrowed.

The City of London (Various Powers) Act contains a part authorizing the construction of subways for the accommodation of pipes and wires belonging to undertakers having powers to lay the same in the City streets. Where such subways are made, and the Corporation direct the removal into them of existing mains, &c., this is to be carried out by the owners at the expense of the Corporation. Mainlaying powers of the ordinary kind are abolished where subways exist. A rent for the use of the subways is to be paid, determined only by the amount of saving of expense attributable to the use of the subway over the cost of mains lying in an ordinary street. The question of liability for accidents is dealt with in a clause. The Corporation are to indemnify companies from any extra risk due to obeying their instructions to use the subways. Power is taken to fix public lighting attachments to building frontages.

The Edinburgh Corporation Act provides for the protection of gas and water mains in regard to tramway works. Sanction is given to the erection of a Corporation tramway power station at Portobello.

The Falkirk and District Water-Works Act authorizes the construction of an impounding reservoir on the Earls Burn, in the parish of St. Minians, Stirlingshire, and other works for improving the water supply of the district. Compensation water is to be discharged. The works are to be completed within seven years. Additional water capital to the amount of £90,000 is sanctioned. The area of compulsory supply by the Trustees is extended.

The Halifax Corporation Act extends the boundaries of the borough, dissolves the Urban District Councils of Northowram and Warley, and transfers their property and rights to the Corporation. Dispossessed officials are to be compensated under section 120 of the Local Government Act, 1888. Power is taken to hold lands in the drainage areas for the protection of the Corporation water-works. The Elland and North Bierley Gas Companies' mains are protected in the case of road alterations by the Corporation for tramway purposes. The Corporation take powers to alter gas and water service pipes when necessitated by street improvements. Compulsory powers are given for the attachment of wall-brackets to building frontages. A Corporation Fire Insurance Fund may be founded, to the amount of £50,000.

The Margate Corporation Act extends the water limits of the Corporation to include the parish of Northdown and (subject to conditions) the parish of Garlinge. The pressure of the supply is to be that by gravitation from the high-service reservoir of the Corporation. The rate for domestic supplies is not to exceed 7 per cent. upon the gross estimated rental. The maximum price for metered supplies is 1s. 6d. per 1000 gallons. Public drinking fountains may be supplied gratis. The Margate Water-Works Act, 1857, the Margate Water Order, 1872, and the Margate Water Order, 1879, are repealed. The right (if any) of the Corporation to supply part of the parish of Westgate-on-Sea is preserved. If the right exists, the Thanet Rural District Council may buy the Corporation out within two years; but if it does not exist, then the distributing plant only is to be bought by the District Council. Before this purchase is effected, the District Council must acquire the undertaking of the Westgate and Birchington Water-Works Company. Further water lands to the extent of 40 acres are sanctioned, together with £15,000 additional water loan, repayable in 60 years. Surplus water profits are to go to the district fund.

The Morley Corporation Act contains provisions relating to the administration of the water undertaking of the Corporation. These are of an ordinary and detail character, and include permission to supply public drinking fountains gratis. Water-works loans spent on the construction of the original works are excluded from calculations under the Public Health Act, 1875.

The Motherwell Water (Additional Supply) Act authorizes the Commissioners of the burgh to provide an additional water supply by impounding the Culter Water; the reservoir to be situated wholly in Culter Parish, Lanarkshire. Compensation water is to be discharged down the stream at the rate of 850,000 gallons per day. The land is to be acquired within three years, and the works completed within seven years. Distributing pipes are to be laid in every street of the district, and a sufficient supply afforded on demand. Trade supplies may be metered. A supply in bulk, not exceeding 250,000 gallons per day, is to be given to the District Committee of the Upper Ward of Lanarkshire, on terms to be settled. The Middle Ward Committee may also claim a similar supply, not exceeding 200,000 gallons per day, if there is water to spare. Supplies of water for sanitary or other public purposes may be at a reduced charge, or gratis. No private hose-pipes are to be used without the consent of the Commissioners. The water-rate is to be estimated and levied every year on the full annual value of all lands and premises within the limits of compulsory supply. Provided that for shops the domestic water-rate is to be charged on only one-fourth of the rental, unless the Commissioners shall see cause to charge the full amount. Agricultural lands, underground pipes, &c., are to be rated at one-fourth their annual value. No profits are to be made to relieve rates. Water loans are repayable in 50 years.

The Rotherham Corporation Act contains parts relating to gas and water supply. Additional gas lands are to be acquired for the erection of works, and £65,000 is to be borrowed for this purpose. As regards water, it is enacted that the Corporation shall not be under any obligation to supply the Rawmarsh Council after 1903. A fresh arrangement may be entered into for the supply of water to Rawmarsh at cost price. Nothing in the Act is to entitle the Rotherham Corporation to a greater quantity of water from the Derwent Valley than that to which they are now entitled under the Act of 1899.

The Salford Corporation Act contains provisions enabling the Corporation to make regulations relating to the size of consumers' gas-pipes, and the position of meters. Persons aggrieved by these orders have a right of appeal to a Petty Sessional Court. Anti-fluctuators may be required for gas-engine services; and certain scheduled lands are to be used for the conversion of residuals. Additional gas capital to the amount of £200,000 is sanctioned.

The following Acts form a class by themselves.

The Walker and Wallsend Union Gas Company's (Electricity Capital) Act sanctions the raising of £200,000 additional capital for the Company's electricity supply undertaking, with power to borrow one-fourth of the amount. Debenture stock is not to be issued. Interest is not to be paid on calls out of capital; but the Company may pay interest on calls paid in advance, in conformity with the Companies Clauses Act, 1845.

The County of Durham Electric Power Supply Act incorporates a Company for generating and supplying electrical energy in bulk. The area of operations is specified as comprising seven Poor-Law Union Districts in the county. The general powers of the Company are for the supply of electrical energy in bulk to authorized undertakers of electricity supply. The supply is to be given on demand, upon conditions set out, and is to be metered. Three meters may be used, to check one another. The mains may be either overhead or underground. The capital of the Company is £500,000, with power to borrow £166,000. The prices chargeable for energy supplied are stated in a schedule, and range from 4d. to 1d. per unit, according to the number of hours of maximum supply. There is a sliding-scale, whereby the normal 8 per cent. dividend payable on the capital stock may be increased ¼ per cent. for every 1¼ per cent. reduction in the price of current. The Board of Trade may revise the whole of this arrangement every ten years. Lands for generating stations are to be acquired at Gateshead and at Harraton; but the powers of compulsory purchase are not to be exercised until £25,000 of capital has been subscribed. If the authorized works are not begun within two years and completed within four years, the Board of Trade may order the powers of the Company to cease.

The Lancashire Electric Power Act incorporates a Company with a capital of £3,000,000 with one-third borrowing powers, for the generation and supply of electrical energy. Not less than £100,000 is to be subscribed before the powers of compulsory land purchase are put in force. The works sites scheduled are situated in the parishes of Aspull (Wigan Coal and Iron Company), Parr (R. Evans and Co., Limited), Little Lever (Thos. Fletcher and Sons, Limited), and Davyhulme (Trafford Park Estate). The district of supply is the county of Lancaster south of the River Ribble, and excluding the county boroughs of Manchester, Salford, Liverpool, Bootle, Stockport, and Bolton. The powers of the Act are only to be exercised for the purpose of supplying energy to some general supply district, or to, or on behalf of, some statutory undertakers of such supply. Regulations are imposed for the laying and removal of mains; and the powers of the Act cease if not begun to be exercised in two years, and fully exercised in four years. Statutory undertakers may demand to be supplied with all the electrical energy they need, on scheduled terms. These and the sliding-scale are the same as in the preceding Act.

The South Wales Electrical Power Distribution Act incorporates a Company with a capital of £750,000, and power to borrow £250,000, for the supply of electrical energy from sites at Llantwit, Panteg, and Neath. These lands are to be acquired

within five years. The area of supply includes the whole of the county of Glamorgan, and Monmouthshire west of the Usk, with the county boroughs of Cardiff, Swansea, and Newport. Energy is to be supplied under the Act only to authorized undertakers for distribution, and for power to any person. The Company are not to supply energy directly for lighting purposes. The general provisions of the Act are the same as those of the two preceding Acts. As regards prices of energy and rates of dividend, the former are put at 3d. and 2d. per unit and the latter at 8 per cent. normal. If the Company are supplying at an average price of less than 2½d. per unit, which is called the standard price, then they may divide ¼ per cent. extra for every 1¼ per cent. by which the average price has been below the standard price. This sliding-scale works the other way also. Back-dividends are payable. As in the other cases, these arrangements may be revised every ten years. The Act contains many saving clauses—including one for protecting the Pontypool, Swansea, and Aberdare Gas Companies from injury to their pipes by fusion or electrolysis.

PERSONAL.

Mr. H. M. BAIRSTOW, Assistant Gas Manager to the Darwen Corporation, has been appointed, out of 117 applicants, Assistant to Mr. R. Brown at the Cambridge Gas-Works.

Mr. JOHN BALDWIN, of Honley, near Huddersfield, and formerly assistant at the Brighouse Gas-Works, has been appointed Manager of the newly-acquired gas-works of the Gainsborough District Council.

The will of the late Mr. R. C. SMITH, for many years Chairman of the Devonport Gas Company, has been proved in the sum of £10,787. Mr. Smith was unmarried, and most of his property is bequeathed to nephews and nieces.

As mentioned in our "Notes from Scotland," Mr. J. BALLANTYNE, Manager of the Rothesay Corporation Gas-Works, was last Friday appointed Manager at Hamilton, in succession to Mr. W. Ewing. The salary is £250 a year.

So much nonsense is sometimes talked at meetings of municipal councils when gas matters are under discussion, that the possession of technical knowledge on this subject by even one member of such a body must have a beneficial effect; and when this is allied to other qualifications which are specially valuable in a councillor, the combination cannot fail to be appreciated by the burgesses. An instance of this appreciativeness occurred last week at Banbury, where Mr. W. R. COOPER, the Manager of the Gas Company, was returned for the third time at the top of the poll. Mr. Cooper has been on the Council of that ancient borough since 1891, when he stood fourth on the list, with 897 votes. In 1894, he increased his number to 1003, in 1897 to 1150, and now it is 1207—being 297 above the second man. Such success is evidence of the confidence reposed in him by his fellow-townsmen; and we heartily congratulate him upon it.

OBITUARY.

We regret to learn of the death of Herr OTTO OECHELHAEUSER, of Berlin, at the age of 75. He was the proprietor of the Wilhelmshaven Gas-Works, and during the sixties and seventies, he constructed several other gas-works—including plants at Breslau, Chemnitz, and Cronstadt. Many well-known Continental gas engineers had formerly served under him; among others being Herr W. von Oechelhaeuser, the General Manager of the German Continental Gas Company, and Herr Herzberg, of Berlin.

We regret to record the death, on the 1st ult., at Denver (Col.), as the result of a severe cold, of Mr. GEORGE TREADWAY THOMPSON, the President of the Denver Gas and Electric Light Company. Deceased commenced his professional work with the Laclede Gas Company, and was subsequently associated in New York with Mr. Emerson M'Millin, who was President of that and several other gas companies. In June last year Mr. Thompson became the first President and Treasurer of the Denver Company. He was a member of the Engineers' Club and of the Society of Gas Lighting of New York, as well as of the Western Gas Association, of which he was President last year. He joined the American Gaslight Association in October, 1891, and served on the Council. He was only in his 32nd year, and was not married.

NOTES.

An Acetylene Blowpipe.

M. Bourgerel has communicated to the "Moniteur Scientifique" the results of some experiments on acetylene regarded as a source of high temperature. He had occasion to seek such a source other than that of the electric furnace, so as to avoid all electro-chemical action. He used acetylene in a table blowpipe, such as is commonly used for glass-blowing, and obtained his blast with compressed oxygen from a cylinder. Great, however, was his surprise to find that the flame leaving the blowpipe was exceedingly brilliant, and that, as a matter of fact, the gases did not mix, but burnt only in contact with one another, like a lamp-flame. Little by little there forms at the extremity of the blowpipe a cone of deposited carbon, in the form of a truncated cone with the base outwards. This carbon is very hard, with a bright steel-grey fracture. The very brilliant flame produced at the upper end of the cone is also exceedingly hot. The temperature of the acetylene which burns in the air round the end of this carbon cone is not very high. An examination of the flame quite justifies the theory of the dissociation of the acetylene at the moment of its combustion. As M. Bourgerel did not want an incomplete combustion in his blowpipe, he hit upon the idea of returning to the use of compressed air, enriched with oxygen to such a degree as experience might show to be expedient. This arrangement answered perfectly. With the non-luminous flame, there is heat enough to melt platinum in a few seconds; while the disadvantages of the electric furnace and the oxy-hydrogen blowpipe are avoided. M. Bourgerel thinks that, both in commercial work and also for laboratory purposes, there are immense advantages to be gained by the use of such a source of heat.

Making an Engineer's Note-Book.

Mr. John H. Gregory, Assistant Engineer of the Philadelphia Water-Works, contributes to the "Engineering Record" some hints on the preparation of a professional note-book. It has been said that an engineer's note-book is his stock-in-trade; and Mr. Gregory and Mr. W. B. Fuller claim to have devised a convenient method for keeping such a book. The method is that of using single sheets of paper of a standard size, and binding with M'Gill fasteners in a cloth cover. There are several sizes of such covers; but the writer prefers the 6¼ in. by 9¼ in. size, which is convenient for writing, and possesses the advantage of stacking up with the ordinary octavo volume so extensively used for engineering text-books. With the ordinary bound note-book, notes are jotted down as occasion requires; and unless blank pages are left, in the end the book is filled with disjointed memoranda on a variety of matters—those relating to one subject being scattered all the way through. Of course, the book can be indexed; but even so, it is less convenient than the system of single sheets of punched paper which can always be filed in the right place. It is suggested that a thin paper of good quality should be used for making the book, and that notes should only be made on one side, with ink, preferably by means of a fountain pen. The advantage of this is that a blue-print may be taken of any writing or sketching on such sheets. The writer says he has at present eight of these covers in use, classed under various heads—as Filters, Hydraulics, Sewers, Miscellaneous, &c. He very truly remarks that, if a thing is worth preserving, it is worth preserving well, and in such shape as will always be readily accessible. Neatness and system in note-taking cannot be too early acquired by the engineering student. Since Mr. Gregory hit upon the arrangement described, he has actually transferred his most valuable notes to this system, by doing a sheet or two a day, which requires but a few minutes; and the convenience for reference, compared with looking through the pages of old note-books, has far outweighed the time spent in copying.

Lessons of the Paris Exhibition.

The Manchester Association of Engineers are the first technical body to hold a "symposium" on the lessons of the Paris Exhibition. Mr. Henry Webb read a short paper on "Metallurgy" at the exhibition, in which the excellence and number of the French exhibits were acknowledged. Several British firms maintained the reputation of this country; and the feature of the American show was the tool steel, working hot at high speeds, of Messrs. Taylor and White. He thought the exhibits showed, as a whole, that other nations could do as well as ourselves, and will become increasingly keen competitors in the markets of the world. Mr. Alfred Saxon spoke of the stationary engines shown at the exhibition; remarking that this section might fairly be said to be the largest, most comprehensive, and cosmopolitan collection ever brought together. He drew attention to the improvement in lubrication devices, and the study of valves and their gearing. The slide-valve appears to have become obsolete, and the piston-valve nearly so. The Sulzer and Corliss types predominated. Mr. Saxon thought that English engineers were not behind-hand in the principles and ideals of steam-engine practice; but they did not pay sufficient attention to details and finish. High speeds are inevitable; and better design and workmanship must be forthcoming. The steam-engine of the future will be a more expensive article. Speaking of machine tools, Mr. Samuel Dixon characterized the national exhibits as typical. Compared with previous exhibitions in Paris, the machine tools showed a striking advance in every respect. There was ample evidence that high mechanical skill is not the monopoly of any one firm or country. Among the machines for light manufacturing purposes, the Americans showed to advantage; but in heavy machines for general engineering work, the best examples were to be found in the English, German, and French sections. Reviewing the exhibition as a whole, it was evident that the important part which machine tools play in the productive capacity of a nation is becoming much more generally recognized; and engineers are becoming more alive to the necessity of only putting down the very best of everything.

COMMUNICATED ARTICLE.

ILLUMINATING GAS FROM SEWAGE SLUDGE.

By X. Y. Z.

Although not coming within the range of what are regarded as practical politics, this subject is one, akin to many others, from which, by careful and impartial consideration, much benefit may be derived. The first impression likely to be created at the bare suggestion, to an unscientific mind, is one of contempt and ridicule. This has also been true of many another suggestion which time has modified, and in many cases completely overcome. It cannot be readily forgotten that our forefathers treated with the utmost disdain the suggestion of coal carbonization. The apparently preposterous idea of distributing an inflammable fluid through pipes, was one ridiculed alike by the Press and public. Great alarm was evinced at the proposal to store gas in holders at various stations. It is therefore only reasonable to briefly pass in review the early history of coal-gas lighting, when considering a new proposition relating to gas manufacture generally.

The presence of large quantities of marsh gas existent in sewage matter has been realized for many years; but the utilization of the same, and more particularly in connection with gas-works, is comparatively speaking new. At the outset, it will be recognized that only exceptional circumstances can possibly justify the carbonization of such sewage material in a properly organized gas-works. Unfortunately, exceptional circumstances are not so rare as might at first be conceived. As an illustration, it may be pointed out that difficulties with coalowners have arisen upon more than one occasion in the history of coal-gas manufacture and distribution. Such contingencies as a waterway being blocked with ice, or railway traffic congested, thrown into confusion, and utterly demoralized by a fog of some days' duration, when stocks of coal are at a minimum, are emergencies liable to arise every winter in connection with some gas-works undertakings.

It must be at once assumed that special apparatus for the carbonization of different material is necessary. Retort settings, however well constructed for coal, pure and simple, would require certain modifications to suit them for another and totally different class of raw material. Lower heats would of necessity be desirable for the proper distillation of material including quantities of oil; the latter having to be "cracked up" at the most suitable and uniform temperatures. Alterations, too, in the methods of purification of the gas would have to be carefully adjusted. A few years ago, the idea was suggested in the "JOURNAL" columns that the Yeadon revolving retort was likely to be the best form for the perfect carbonization of sludge. This retort has not been a success for "high" heats, such as are used in coal-gas manufacture, but would probably be useful for "low" ones; the working parts of the gear-work being unlikely to be affected by the lower heat to which they would be subjected.

Respecting the objectionable nature of sewage sludge, it might be argued that this material has to be dealt with somewhere and somehow; and therefore, if it is possible to cope with it once and for all by carbonization, the better for all parties concerned. Considerable objections would arise between two departments—such as the gas and the sanitary—if the material were carted to the gas-works. The sanitary authorities might advantageously erect at their sewage-works a retort-bench and purification apparatus capable of dealing with the quantity of material for disposal, thereby performing the duplicate process of manufacturing gas and destroying the sludge. Such gas could then be purified and delivered through a meter, or any other method of measurement, into the gas-mains. This arrangement would be in accordance with the views expressed in an "Editorial Note" last week, to the effect that it was undesirable to allow any such material to enter a gas-works, as it would upset the carbonizing plant and alter all the existing methods of calculation as to results. The raising of the heat required for the retort-settings by dust refuse may be disregarded. In some sewage and electric works, steam is raised by this means, with the assistance of forced-draught appliances to a greater or less degree. To what extent this arrangement is a success is doubtful. In any case, forced draught contrivances have not been applied to retort-settings, except in rare instances. Certainly, no well-designed setting, worth the name, has such an apparatus attached to it.

There is a serious aspect likely to arise from the side of the consumer, as the moment it was suspected that sewage sludge material was being used, there would undoubtedly be a "hue and cry" respecting the vileness and impurities emanating from the gas. This, of course, would be only the result of want of information on the subject, as the purification of any gas can be readily accomplished; it being only a chemical problem to decide the means. A diamond is only carbon; and marsh gas, from whatever source obtained, remains unaffected. In dealing with such a subject, the objectionable idea must be subordinated for the time being, except so far as it becomes injurious to health.

The practicability of obtaining illuminating gas from sewage sludge has been pointed out at intervals by correspondents. The latest published results forthcoming are from Mr. Edward A. Harman, M.Inst.C.E., the Gas Engineer of Huddersfield. In the "JOURNAL" last week certain results were stated, and opinions held by him were published, which are worthy of close attention. Other results have been obtained at Chorley; and further experiments are in progress, as was also indicated last week. It is not surprising to find a praiseworthy desire on the part of gas engineers to recover the percentage of illuminating gas known to be present in sewage matter, and to apply it to economic use. Such a desire is the natural outcome of, and possibly one of the benefits to be derived from, the extortionate high prices demanded for coal. Times of stress and storm reveal certain weaknesses in the vessel, which the skilled mariner quietly makes note of for use in fair weather. Similarly, the unpleasant position the gas industry has been forced into by the combination of the coalowners, leads thoughtful men to consider what resources can be relied upon and adopted to provide, in some measure at least, against distress. The development of carburetted water gas is only one aspect of the great question. The economical working, too, of these plants is dependent upon low prices prevailing for coke and oil. At the present time, these commodities are at maximum rates; thereby handicapping this method of manufacture considerably. The important argument for the manufacture of water gas now relies upon its rapidity and easy usage when required.

To-day, the calorific value of gas is of really greater importance than its illuminating property. According to the evidence of experts upon the subject, gas of low illuminating power, within certain limits, has a higher calorific value than that of better quality. To such an extent has this become realized, that few gas-works of any size do not now daily make regular calorific tests contemporaneously with the photometrical ones. After all, the question becomes merely one of cost. If from inferior material illuminating gas can be produced capable of performing the duty required by coal gas, although possibly with slightly less efficiency, it is one which will commend itself to consumers.

The question of a combination of coal consumers to resist the greedy demands of the coalowners is one alluded to by Mr. Harman in his letter last week. He rightly says that such combination can take various forms. Therein lies the strength of the argument. One cannot confess to being in love with the idea of raising illuminating gas from sewage sludge. But in this connection, it may be remarked that every experimentalist is in danger of thinking too highly of his own pet scheme. Although the subject is likely to be an unpopular one, the principle of searching for some substitute for coal is one which commends itself to all gas engineers under the existing circumstances—circumstances which have paralyzed the efficiency and profit-earning capacity of the undertakings placed under their control, and for which they are directly responsible.

The question of carbonizing sludge in inclined retorts is certainly open to criticism and doubt. Even coals of different qualities and size require the retorts set at different angles. It has frequently been pointed out that one reason why inclined retorts fail to discharge their contents automatically, is because the coal with which the retort is charged has an angle of repose differing from the residual coke after carbonization.

The evidence as yet in favour of the wholesale carbonization of sludge is absolutely inconclusive; nor, it will be admitted by the most sanguine, is it particularly favourable. The results obtainable by local tests on an admittedly small scale of a material noted for its variability of composition, do not warrant any immediate excitement upon the subject. At the same time, it will not be forgotten that history has repeatedly proved that small beginnings have frequently big endings; so, in all justice to those gentlemen who have gone to considerable trouble experimenting with the material, the subject should not be disregarded, much less carped at. It has been suggested that some engineers could very desirably make tests occasionally as opportunity may arise. Some gas-works are situated in close proximity to the local sewage-works; and in these cases the opportunity for experiments is always more or less present, with a minimum of difficulty. As stated, the cost of destroying sewage matter in some towns is enormous. Many conflicting interests will, however, have to be overcome before the sanitary authorities will be prepared to pay to the local gas undertaking the amount, or any portion of it, it now costs them to destroy their sewage. The correct solution of the problem, as heretofore hinted at, would be for the sanitary authority to erect a retort-bench, or preferably a small gas-works, suitable for the special work. The money now spent in destructors, &c., would fully warrant such a step. By this means, all such tests could be kept independently from the gas-works. The variability in the composition of sewage matter presents a real difficulty; but an experimental plant at a sewage-works would provide means for ascertaining approximately the average quantity and quality of gas obtainable throughout an entire period.

The abolition of the moisture from the sewage sludge does not present an insuperable difficulty. Greater pressure brought to bear upon the material in its preliminary stages would accomplish much. If, instead of the material being pressed into cakes, it were made into briquettes in an efficient machine, these would be much better in every way for subsequent handling. The sludge, indeed, requires careful study and arrangement to adapt it to its changed manipulation and circumstances.

The large quantity of marsh gas, &c., present in sewage matter, certainly warrants an extensive and full inquiry. From the sanitary standpoint, the subject is full of importance. The complete

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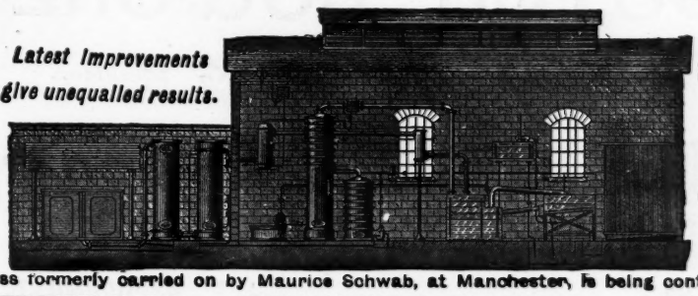

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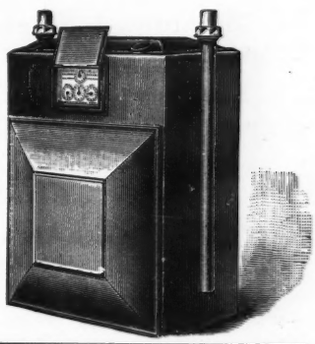

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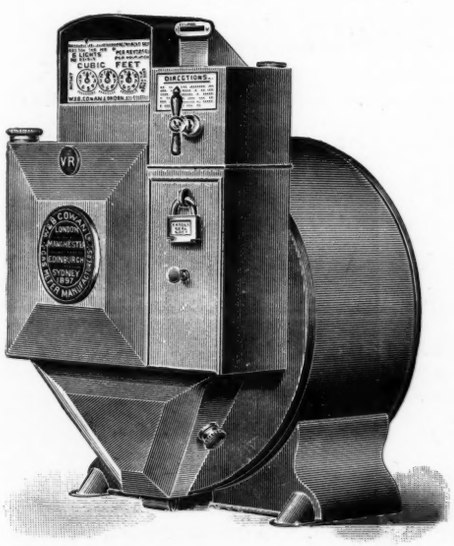

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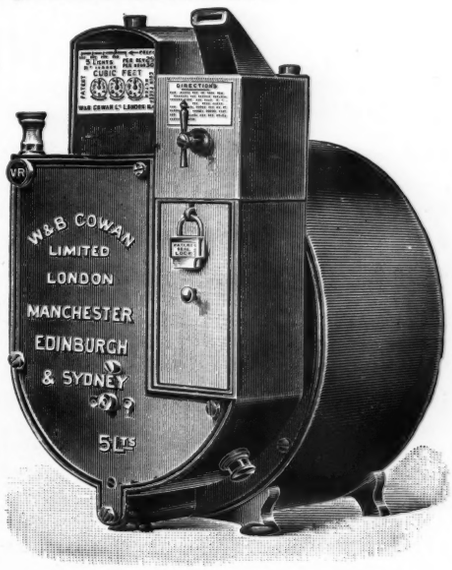

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destruction of the material alone favours the process. It is a fact that the question of sanitation is becoming an increasingly difficult problem in all large centres of population. Anything, therefore, which will aid in such a matter should unquestionably be gladly welcomed by sanitary authorities. Something further requires doing now. Mr. Harman and others have demonstrated the practicability of sewage sludge being carbonized under different conditions. Careful analyses of the composition of the material in various parts of the country should be attempted. This could be well dealt with by the medical officer of health, upon whom devolves the direct responsibility for the health of the community. Possibly such information is already in the hands of many of these gentlemen, including, as they do, some of the first scientists of the day. At the majority of sewage works, too, qualified chemists are engaged, who may well turn their attention to the subject. What in days gone by must have proved a sufficient obstacle to the handling of the material, is in these days of multiplied mechanical contrivances abolished with the greatest ease.

The absence of tar is inconsequential for the moment, while that residual is at so low a price. The quantity of ammonia recoverable will compensate; sulphate of ammonia being likely to well maintain its price in future. The education of the farmer to its agricultural value is spreading, as the result of the energetic efforts of the Sulphate of Ammonia Committee, with Mr. W. G. Blagden as Chairman. A reduced quantity of coke output would also enhance the price of that placed upon the market, as, in a measure, carburetted water-gas plants must already have done.

Scraping Water-Mains.—The practice of scraping water-pipes by means of a revolving tool carried along by the pressure of the water is on the increase. The operation has just been performed at Dunfermline, where the main was delivering water at the rate of 1,350,000 gallons per 24 hours. After it had been scraped, its delivery was increased by 100,000 gallons a day.

The "Largest Order" for Coal ever Placed.—The leading colliery proprietors in South Wales have been invited by the Admiralty to tender for the supply of about 800,000 tons of steam coal for delivery over next year. This is intended to obviate the spasmodic purchases formerly made by the Admiralty Lords, which often had a disorganizing effect upon the market. It has been widely stated (even in the journals of the coal trade) that this is the largest order ever placed at one time in the coal market. Of course, that is very far from being true; the Gaslight and Coke Company having frequently invited tenders for close on two million tons—their annual consumption of coal.

Estimating the Sulphur in Coal.—In the "Gazzetta Chimica Italiana," Signori V. Antony and A. Lucchesi have modified Eschka's method of estimating the sulphur in coal, and proceed by heating 1 gramme of the material, 4 grammes of pure manganese dioxide (M_nO_2), 1 gramme of M_nO_4, and 2 grammes of dry $NaCO_3$, in a small platinum crucible. The heat is applied gently at first, and finally increased up to a bright red. The mass is then plunged into from 40 to 50 c.c. of water, acidulated with nitric acid, boiled, filtered, and the sulphate finally precipitated with barium chloride. The authors give a series of comparative analyses made by their method and by that of Eschka, which show theirs to be as exact as the latter.

Coating for Underground Pipes.—A new construction of underground pipe has been devised, according to the "Chemical Trade Journal," by a resident of Los Angeles, California—Mr. William Lacey. It is an improvement on a former patent, and is intended to provide a pipe having superior powers of resistance to the destructive forces to which underground mains are subjected after being laid, and also to prevent injury to the pipe while in transit. It comprises a metal shell, or body, a fibrous coating outside the shell, an outer coating of granulated hard non-elastic material, and a suitable binding substance. Preferably the shell has a coating inside and out of asphaltum or other gum, and a fibrous sheet is applied outside the coated pipe with a coating of asphaltum or other gum. Over the sheet is a coating of fine gravel embedded in, and held by, the coating of gum on the sheet.

Smoke Abatement.—Writing on this subject in "Cassier's Magazine" for the present month, Mr. W. H. Bryan points out that the largest smoke makers, and the most difficult to deal with, have always been the furnaces of steam-boilers. No war against the smoke nuisance can be waged successfully without a good working ordinance, clearly defining the character of the smoke emission which is unlawful, and providing suitable penalties. Many such ordinances have been passed—in fact, nearly all the larger cities of the United States have enacted legislation of this kind. Much of this was experimental, and, when carried into the Courts, did not stand against the attacks of opposing Counsel. Many ordinances were declared invalid; but some have been upheld by the higher Courts. In addition to providing a good ordinance, a municipality can help the movement in other ways. It can provide an expert Commission, to aid smoke makers in finding proper remedies, and to investigate and test improved devices; and—most important of all—it can take the lead, and set a good example by stopping the smoke from its own furnaces, in water-works, schools, public buildings, and institutions.

THE INTERNATIONAL GAS CONGRESS.

THERMIC REACTIONS IN THE DISTILLATION OF COAL.

(*Concluded from p.* 1084.)

By M. Euchene.

[A Communication to the International Gas Congress in Paris.]

The heat-balance for the distillation of coal in an ordinary setting of seven retorts, and the sources of loss of heat in such a setting, having been dealt with, M. Euchêne proceeds to draw up a similar heat-balance for the Siemens setting of eight retorts, and then discusses the relative advantages of the two settings in regard to the loss of heat through different channels. He deals only with coal of Type No. 3 in the Siemens setting. In this setting, the consumption of fuel varies with the season and the works; but the mean of several years' work with modern installations is 14·80 parts of coke per 100 parts (by weight) of coal distilled. In 24 hours, 7200 kilos. (141¾ cwt.) of coal was carbonized in the setting of eight retorts. The water evaporated and carried into the furnace amounted to 40 per cent. of the weight of coke, or 5·92 kilos. per 100 kilos. of coal carbonized. The coke had the same composition as that used in the ordinary furnace. The operations must be discussed under three heads —viz., (1) the producer, (2) the furnace, and (3) the recuperator or regenerating system. A summary of the data and the calculations, which are given at length in the Sixth Appendix to M. Euchêne's communication, follows.

The average composition of the producer gas was: Carbonic acid 6 per cent., carbonic oxide 25 per cent., hydrogen 8 per cent., and nitrogen 61 per cent. Its temperature was 800° C. The smoke or chimney gases from the furnace consisted of: Carbonic acid 18·37 per cent., oxygen 1·82 per cent., and nitrogen 79·81 per cent.; and their temperature was 1050° C., which was reduced to 600° at the outlet of the recuperator. In addition to the moisture (= 1·104 cubic metres of vapour) in the coke, there had been introduced into the producer 5·92 kilos. (= 7·363 cubic metres of vapour) of water evaporated under the grate; and the producer gas contained 5·803 cubic metres of hydrogen, of which the coke had yielded 0·828 cubic metre, leaving 4·975 cubic metres of hydrogen as having been produced by the decomposition of an equal volume of water vapour. Hence, of the water evaporated under the grate, 7·363 − 4·975 = 2·388 cubic metres remained as undecomposed water vapour. The loss of heat through radiation, &c., from the furnace was found to amount to 55,933 calories per hour for the whole setting; and as the setting carbonized 7200 kilos. of coal per 24 hours, the loss of heat from this cause amounted, per 100 kilos. of coal carbonized, to

$$\frac{55{,}933 \times 24 \times 100}{7200} = 18{,}644 \text{ calories.}$$

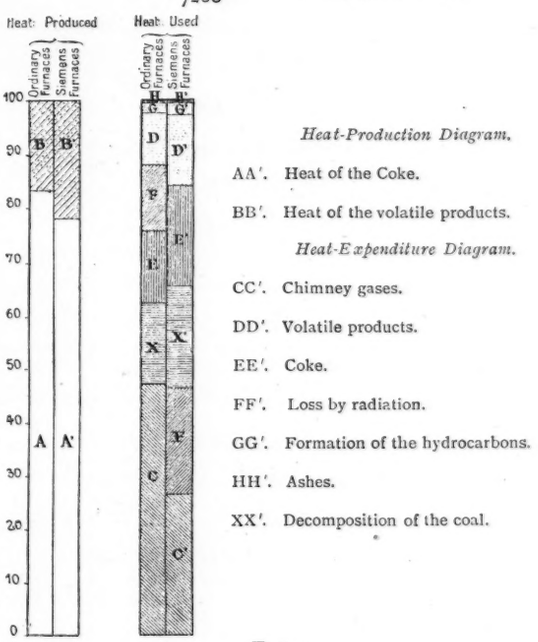


Fig. 5.

The loss of heat through radiation, &c., from the recuperator was found to amount to 7158 calories per hour; and therefore the loss of heat from this cause amounted, per 100 kilos. of coal carbonized, to

$$\frac{7158 \times 24 \times 100}{7200} = 2386 \text{ calories.}$$

The balance of heat provided and consumed in the Siemens setting, as shown in the table on next page, is then compared by M. Euchêne with the similar balance for an ordinary setting carbonizing the same coal, as given earlier in his communication (*ante*, p. 1084). Fig. 5 gives a graphic comparison of the

Heat-Balance for 100 Kilos. of Coal No. 3, Distilled in a Siemens Setting of Eight Retorts.

Producer.

Heat Produced.	Kilos.	Calories.
Aa.—Heat from the coke—		
Carbon of the carbonic acid	= 2·335 × 8,080 =	18,858·720
" " " oxide	= 9·728 × 2,473 =	24,057·344
Sulphur	= 0·148 × 2,000 =	296·000
		43,212
Difference, undetermined		1,418
Total		44,630

Heat Consumed.	Cubic Metres.	Calories.
C.—Heat of the (combustible) producer gas—		
Carbonic acid	4·352 × 425·942 =	1,854
Carbonic oxide	18·135 × 257·092 =	4,662
Hydrogen	5 803 × 257·092 =	1,492
Nitrogen	44·249 × 257·092 =	11,376
Water (undecomposed)	2·388 × 851·013 =	2,032
" of the coke	1·104 × 851·013 =	940
Sulphur dioxide	0·103 × 758·000 =	78
		22,434
Decomposition of water vapour	4·975 × 3079 =	15,318
	Kilos	
H.—Ashpit refuse = 20 per cent. of the coke	= 2·96 × 400 =	1,184
F¹.—Radiation—		
From the surface of the producer (7661 cal. per hour)	=	2,554
" " fire-bars " " (2265 " ")	=	754
" " gas-conduit " " (7158 " ")	=	2,386
Total		44,630

Furnace.

	Calories.
C.—Heat introduced by the hot producer gas	22,434
Ab.—Heat furnished by the combustion of the producer gas—	
Carbonic oxide. Cubic Metres. 18·135 = Kilos. Carbon 9·728 × 5,607 =	54,545
Hydrogen 5·803 = 0·518 × 34,462 =	17,865
C.—Heat introduced by the hot secondary air (see below)	22,335
B.—Heat furnished by the volatile products	29,243
Total	146,422

	Cubic Metres.	Calories.
C¹.—Heat of the chimney gases at 1050° C.—		
Carbonic acid from the producer	4·352	
" " " " carbonic oxide	18·135	× 606·081 = 13,629
Water of the coke	1·104	
Water, undecomposed	2·388	
Water from the hydrogen	5 803	× 1005·372 = 9,344
Nitrogen from the producer	44·249	
" of the secondary air	45·022	× 343·318 = 33,536
" in excess	8·410	
Oxygen in excess	2·235	× 343·318 = 767
Sulphur dioxide	0·103	× 908·000 = 94
D.—Removed by the volatile products at 650° C.		17,999
E.—Heat of the red-hot coke at 950° C.		24,585
F².—Losses by radiation, &c.		18,644
Heat absorbed by the formation of carbon compounds		2,547
X.—By difference		25,277
Total		146,422

Heat of decomposition $x = X - B + G = 25,277 - 29,243 + 2547 = -1419$ calories.

Recuperator.

	Calories.
C¹.—Heat of the chimney gases at 1050° C. (see above)	57,370
	57,370

	Cubic Metres.	Calories.
C.—Heat of the chimney gases at 600° C.—		
Carbonic acid from the producer	4·352	
" " " carbonic oxide	18·135	× 237·9,1 = 6,700
Water of the coke	1·104	
" undecomposed	2·388	
" from the hydrogen	5·803	× 740·796 = 6,886
Nitrogen from the producer	44·249	
" of the secondary air	45·022	
" in excess	8·410	× 190·131 = 18,572
Oxygen in excess	2·235	× 190·131 = 425
Sulphur dioxide	0·103	× 638 000 = 66
F³.—Losses by radiation, &c.		= 2,386
C.—Heat carried off by the secondary air, by difference		= 22,335
Total		57·370

Recapitulation.

	Kilos.	Calories.
A.—Heat from the coke—		
Carbon	12·062 × 8,080 = 97,461	
Hydrogen	0·074 × 34,462 = 2,550	100,307
Sulphur	0·148 × 2,000 = 295	
B.—Heat furnished by the volatile products		29,243
Total		129,550

	Calories
C.—Heat of the chimney gases at 600° C. (see above)	= 32,649
D.—Removed by the volatile products at 650° C.	= 17,999
E.—Heat of the red-hot coke at 950° C.	= 24,585
F.—Losses by radiation: F¹ (Producer) 5,694; F² (Furnace) 18,644; F³ (Recuperator) 2,385	= 26,724
G.—Formation of carbon compounds	= 2,547
H.—Ashpit refuse	= 1,184
X.—By difference (see above)	= 25,277
	130,965
Various, undetermined	1,415
Total	129,550

Heat of decomposition, $x = X - B + G = 25,277 - 29,243 + 2547 = -1419$ calories.

No. 3 Coal.—Heat-Balance for the Siemens Setting, in Percentages.

I.—*Producer.*

Heat from the coke	100·0
Heat of the producer gas	50·4
Decomposition of water	34·2
Losses through radiation	12·8
Ashes, &c.	2·6

II.—*Furnace.*

Combustion of the producer gas	49·4
Heat furnished by the volatile products	20·0
Heat introduced by the hot producer gas	15·3
Heat introduced by the secondary air	15·3
Heat of the chimney gases at 1050° C.	39·2
Decomposition of the coal	17·3
Heat of the coke	16·8
Losses through radiation	12·7
Heat removed by the volatile products	12·3
Formation of carbon compounds	1·7

III.—*Recuperator.*

Heat of the chimney gases at 1050° C.	100
Heat of the chimney gases at 600° C.	56·9
Heat removed by the secondary air	38·9
Losses by radiation	4·2

General Recapitulation.

Heat of the coke	77·4
Heat furnished by the volatile products	22·6
Heat removed by the chimney gases at 600° C.	25·2
Losses by radiation	19·9
X	19·5
Heat removed by the coke	18·9
Heat removed by the volatile products	13·8
Formation of carbon compounds	1·9
Ashes, &c.	0·8

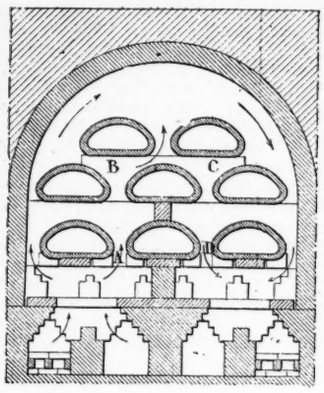


FIG. 6.

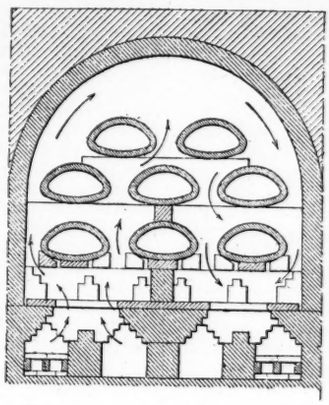


FIG. 8.

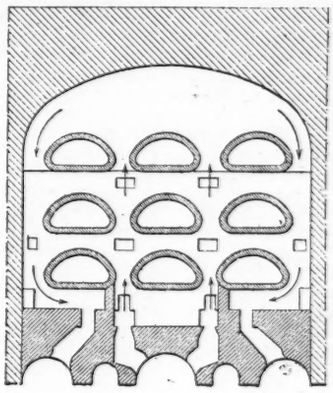


FIG. 9.

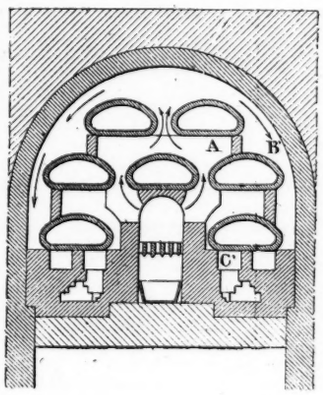


FIG. 7.

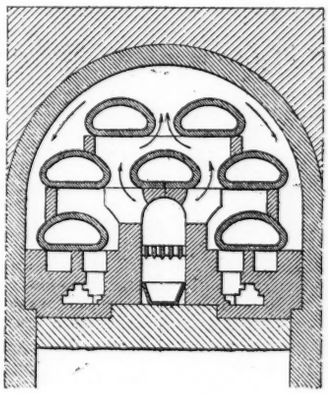


FIG. 10.

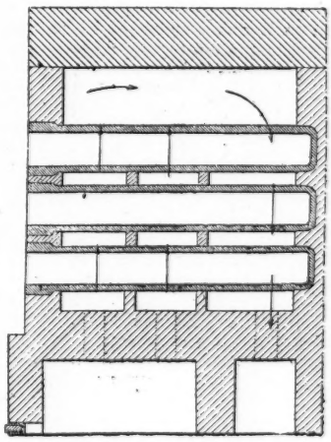


FIG. 11.

results recorded in the tables for the two types of setting. It is evident that the differences between the two types are chiefly in the losses due to the smoke or chimney gases. Speaking generally, other losses appear higher in the Siemens setting, because, even though they are actually the same as with the ordinary setting, they are compared with a smaller consumption of fuel. The losses through radiation, however, are really greater with the Siemens setting, because of the producer and recuperator, which are absent with the ordinary setting.

On comparing the heat carried off by the chimney gases, the following differences are apparent :—

	Temperature of the Chimney Gases.	Heat Lost through the Chimney Gases. Calories.	Volume of Chimney Gases. Cubic Metres.
Ordinary setting .	975° C. ..	81,311 ..	212
Siemens „ .	600° „ ..	32,649 ..	132
Differences .	375° C. ..	48,662 ..	80

It is evident from these figures that the economy of fuel is not due simply to the difference of 375° C. in the temperature, but also to the smaller volume of the chimney gases. The heating of the air by these gases in the first place is responsible for an economy of fuel, which reacts on, and diminishes, the volume of the gases, thereby inducing a further economy. These are the two chief causes of the economy. There are subsidiary ones, which may also be glanced at.

The excess of air in the ordinary setting, which is equivalent to an excess of oxygen amounting to 4½ per cent., corresponds to a loss of heat of 14,000 calories, or 9·7 per cent. In the Siemens setting, the excess may be entirely avoided; but practically the regulation of the air supply is such that a mean of 2 per cent. of oxygen is allowed in the chimney gases. This 2 per cent. of oxygen, however, has not the same significance as in the gases from an ordinary furnace, because it is referred to a smaller volume of gases, and because the surplus volume leaves the setting ultimately at 600° C., instead of 975° C.

Next, with regard to the temperature of the chimney gases at the outlet of the furnace proper, 1050° C. in the Siemens compares with 975° C. in the ordinary setting. When the temperatures are observed at different parts of the settings, as shown in figs. 6 and 7, the following results are found :—

	Temperature (° C.) at Points.						
Setting.	A.	B.	C.	D.	A^1.	B^1.	C^1.
Siemens . .	1250	1120	1080	1050	..	..	..
Ordinary . .	..	..	..	..	1250	1070	975

If the temperature at that point in the ordinary furnace which corresponds with the point A in the Siemens furnace—viz., near the grate below the middle retort—is determined, it will be found to be 1350°, or even 1400° C. The fall of temperature will be, in the Siemens furnace, from 1250° to 1050° = 200° C.; and in the ordinary furnace, from at least 1350° to 975° = 375° C. The fall in temperature is equivalent to a thermic efficiency of 13·1 per cent. in the case of the Siemens, and of 23·1 per cent. in that of the ordinary setting, which shows that, from the *thermic standpoint exclusively*, the ordinary setting utilizes the heat better than the Siemens setting apart from its recuperator. But from the *gas maker's standpoint* such a great fall of temperature must be avoided, because all the retorts in the setting are charged alike, and the last ought to be as highly heated as the first. The Siemens setting most nearly gives this ideal condition of heating, as will be apparent from a study of figs. 8, 9, and 10. The defect indicated is not peculiar to the ordinary setting. It occurs in most furnaces in which the stream of gases continuously follows the same course, as in those generator furnaces and recuperative settings in which the stream of gas ascends in the middle and descends at the sides. In these cases, the fall in temperature is less than with the ordinary setting; but it is greater than with the Siemens setting, as shown in fig. 8, because the latter admits of the reversing of the direction of the stream of gases, so that it is sent equally to the right and to the left. There is, however, a later pattern of Siemens setting (shown in fig. 11) in which the recuperation is direct and continuous. The excess of heat which prevails at the far ends of the retorts is taken advantage of; and the stream of gases is there deflected downwards. Combustion takes place above two-thirds of the base of the furnace; while the remaining one-third is heated by the flames as they return. The stream of gases in this case takes a constant course. The arrangement, however, possesses method, in that the flames which are already somewhat cooled are used to heat the part of the setting which naturally is the hottest.

The more uniform heating which the Siemens alternating furnace affords, presents the means of working off properly larger charges of coal; for all the retorts are equally hot, whereas in the ordinary setting the first retort is very hot, and if the charges are regulated according to what this retort will work off, the charges in the other retorts will be only partially carbonized—it being practically impossible to alter the weight of the charge to suit each retort in a setting. Hence it has been found that a Siemens setting of eight retorts carbonizes 7200 kilos. (7·085 tons) per 24 hours, against about 5800 kilos. (5·710 tons) with an ordinary setting of seven retorts. Moreover, the number of retorts in a Siemens setting may be increased to nine, or even more, with advantage. Further, a great fall of temperature in

the setting is fatal to the durability of the retorts; while the grate of the ordinary setting also becomes rapidly corroded. Consequently, while the average life of retorts in ordinary settings is about twenty months, and the grate in that time needs repair twice or thrice, the average life of retorts in the Siemens setting is four to five years, with slight repairs and cleaning of the recuperators, at intervals of twenty months. Every means which, like the Siemens alternating furnace, helps to reduce the fall of temperature in the furnace-chamber, is favourable to the carbonization of the coal, because it makes larger charges feasible, and prolongs the life of the retorts.

But if the observation of the fall of temperature is extended to the exit of the recuperator of the Siemens setting, we find the fall is from 1250° to 600° C., or 650° C., against the 375° observed in the ordinary setting. The thermic efficiency is 43·3 per cent. for the Siemens setting, against 23·1 per cent. for the ordinary. Clearly this is the characteristic feature of the recuperative setting. On the other hand, the total losses from radiation are somewhat increased with the latter; but this is a slight disadvantage compared with the many advantages which recuperation affords. The heat of decomposition of coal Type No. 3 was found to be only −1419 calories in the trials with the Siemens setting, against −3598 calories with the ordinary setting. The difference is very small, when all the possible sources of error are considered.

From this comparison of the results obtained with the two settings, M. Euchêne passes on to consider in detail the different terms of the equation for the Siemens setting.

In the producer, the aim, he says, should be to secure gas as rich as possible in combustible constituents. Theoretically, the producer gas should consist of 34·7 per cent. of carbonic oxide and 65·3 per cent. of nitrogen. The composition which has been taken as a normal average in this communication is 6 per cent. of carbonic acid, 25 per cent. of carbonic oxide, 8 per cent. of hydrogen, and 61 per cent. of nitrogen. The gas actually, as it leaves the producer, would contain only 5 per cent. of carbonic acid; but a slight combustion of carbonic oxide occurs in the gas-nozzles leading to the combustion-chamber. The sum of the combustible constituents is 25 + 8 = 33 per cent., which is much the same as the theoretical 34·7 per cent. of carbonic oxide; and hydrogen has, volume for volume, nearly the same calorific power as carbonic oxide. Thus the calorific power of the mixture actually obtained is practically the same as that of the theoretically perfect producer gas. But it should not be forgotten that 1·14 of the 8 per cent. of hydrogen is the hydrogen of the coke, and that the remaining 6·86 per cent. only comes from the decomposition of water. Consequently, properly speaking, only 31·5 to 32 per cent. of the mixture consists of combustible constituents derived from the gasification process; and carbonic acid has taken the place of the balance which should theoretically be present. But theoretical reactions cannot be achieved in an industrial operation, and a little carbonic acid escapes the decomposition by which it would yield carbonic oxide. Further, the water below the fire-bars, which is needed to keep them cool, tends to reduce the temperature of the fuel and to impede the formation of carbonic oxide; while the decomposition of the water vapour by carbon yields hydrogen and carbonic acid rather than hydrogen and carbonic oxide, unless there is an excess of heat available to furnish the greater amount of heat required for the latter reaction. The best conceivable conditions would be the vaporization of just sufficient water to keep the fire-bars cool, and the avoidance of any surplus water vapour passing into the fuel to lower its temperature. Actually, some water vapour passes undecomposed through the producer, and leaves the recuperator at 600° C., thereby carrying off 1769 calories. The amount will vary with the section of the producer and grate; being less where they are large, and frequent cleaning of the fire-bars is unnecessary.

Though hydrogen and carbonic oxide have, volume for volume, nearly the same calorific power, the heat carried off by the products of their combustion differs greatly; being, at 600° C., 298 calories for carbonic acid and 741 calories for water vapour. Hence it would appear better to burn carbonic oxide than hydrogen. But, on the other hand, the hydrogen and its attendant carbonic oxide are produced without the aid of primary air, though double the amount of secondary air is subsequently needed, since a given weight of carbon always requires the same volume of air for its complete combustion. But where the secondary air supply only is heated, the decomposition of water vapour increases the heat recovered by recuperation.

Means may be taken to limit the amount of carbonic acid formed in the producer—for instance, the maintenance of a constant and sufficient depth (not less than 4 feet) of coke in the producer, and the adoption of large producers in which the gas is brought as little as possible in contact with the walls. It was proved, by analyses of samples of gas drawn from different points in a producer, that carbonic acid is really formed in the first place, and carbonic oxide subsequently. At a distance of 12 inches above the fire-bars, the gas contained carbonic acid (from 3 to 8 per cent.) and oxygen (9½ to 16½ per cent.), but no carbonic oxide. At 24 to 28 inches above the grate, there was from 5 to 10 per cent. of carbonic acid, and from 11 to 25 per cent. of carbonic oxide. At 40 inches above the grate, the carbonic acid was from 2 to 4 per cent., and the carbonic oxide from 26 to 28 per cent. Hence the transformation of carbonic acid into carbonic oxide may be regarded as being first complete at about 40 inches from the grate.

The producer gas leaves the producer at about 800° C., and should enter the combustion-chamber as quickly as possible, in order that loss of the sensible heat of the gas may be avoided. In the early Siemens furnaces, a long collecting syphon allowed the gas to cool to 400° C., entailing a loss equal to about 10 per cent. of the calorific value of the coke; but this loss is avoided in the present Siemens settings. The losses through radiation amount to 12·8 per cent. of the heat liberated in the producer, or to 4·7 per cent. of the total calorific value of the coke. The feeding of the producer with red-hot coke would result in an economy of 5·9 per cent. of the coke consumed; but, as already pointed out in the case of the ordinary setting, the plan would be troublesome, and at times impracticable.

With regard to the furnace of the Siemens setting, the utility of the alternating procedure and the ease of regulation of the secondary air supply have already been insisted upon. The theory of recuperation may, however, be considered with advantage. In ordinary combustion of carbon to carbonic acid, the chimney gases have a volume equal to that of the air needed for the combustion. When the combustion is effected in two stages, as in regenerative settings, the volume of primary air needed is equal to that of the volume of secondary air, and is half the volume of the chimney gases produced. Hence, when only the secondary air is heated, since there is double its volume of chimney gases, only half of their heating value is utilized. In the recuperator, the heat is distributed thus:—

	Calories.		Calories.
Heat furnished by the chimney gases at 1050° C. . .	= 57,370	Heat carried off by the chimney gases at 600° C. .	= 32,649
		Radiation	= 2,386
		Difference = the heat recovered by the secondary air	= 22,335
	57,370		57,370

From these figures, the temperature of the secondary air may be calculated, taking the capacity for heat of the air at 800° to 1000° C. as 0·325. The volume of secondary air is 67,635 cubic metres; hence—

Temperature of the secondary air × 0·325 × 67,635 = 22,335

∴ the temperature of the secondary air = 1016° C.

As the chimney gases leave the furnace at 1050° C, better recuperation than these figures indicate could scarcely be had.

In systems of recuperation other than the Siemens alternating one, the heat is transmitted from the gases to the air through thin fire-brick walls. The scope of this communication does not admit of their consideration; but it may be pointed out that the alternating system precludes any admixture of the streams of gases and air, and affords uniformity in the heating of the retorts. But whatever system of regenerative firing is adopted, a somewhat costly installation is required.

As the chimney gases leave the recuperator carrying 32,649 calories, it is important to see if a part of this heat cannot be utilized. A temperature of 150° C. is sufficient to ensure the draught of the chimney; and this would necessitate 11,376 calories passing away with the chimney gases, leaving a balance of 21,273 calories. The utilization of this amount of heat would be equivalent to a saving of 21·2 per cent. of the heating value of the coke. Hitherto the utilization of this heat has been seldom attempted, for fear of the complication of the working and apparatus. Economy of fuel is always a desirable achievement; but it is not the chief object of gas-works management. Nevertheless, the most simple means of economizing fuel should be studied, and two appear feasible. The first consists in cooling the chimney gases from 600° to 150°, in the manner in which it is actually effected in the Munich settings, in which continuous recuperation takes place; the primary air being heated after the secondary air. The second is to modify the Siemens alternating system so that both secondary and primary air are heated to a uniform temperature of about 1000° C., and the chimney gases cooled to 150°. This appears a rational scheme. But to carry it out, reversing or alternating of the primary air and a steam-injector, as well as of the secondary air and gases, would have to be arranged for; and the Siemens system would become much more complicated than now. If it were a question of extremely high temperatures, such as are required in the glass industry and in metallurgy, or if economy of fuel were a paramount consideration, the additional complication could be tolerated; but in the gas industry only comparatively high temperatures are needed, and economy of fuel is a secondary consideration. Hence a scheme involving such great complication cannot be entertained in gas manufacture.

M. Euchêne next proceeds to discuss the distribution of the heat furnished by the furnaces at the different stages of carbonization, &c., if having been taken for granted hitherto that all the reactions occur uniformly and constantly. He observes that it is difficult to locate the causes of variations which have their origin outside the retort; but in the ordinary furnace the frequency of the cleaning of the grate has considerable effect. Even when the clinker is removed as frequently as once in four hours, the chimney gases will show great variations in composition. For instance, immediately after cleaning they may contain 18 per cent. of carbonic acid and 2 per cent. of carbonic oxide, and just before cleaning 14 per cent. of carbonic acid and 6 per cent. of oxygen; the residue in both cases being nitrogen. The variations may be reduced by means of orifices in the furnace-door. In regenerative settings, however, if the producers are

of adequate size, only insignificant variations are found even with but one cleaning of the fire-bars in 24 hours. The exterior of the retort does not vary greatly in temperature with the interior conditions, for it is constantly in contact with the hot gases and the hot fire-brick supports, &c., in the setting.

In the interior of the retort, however, some great variations occur. As a first step towards their investigation, an attempt was made to determine the temperature at different stages during the carbonization. In order to avoid exposing the couple of the Le Chatelier pyrometer to the sulphuretted hydrogen in the retort, two iron tubes plugged at the end within the retort were used; one being plunged in the charge and the other being above it. Observations were made at distances of 1·3 metres (51 inches) and 0·45 metre (18 inches) from the mouth of the retort; and the results are shown in the diagrams figs. 12 and 13. Above the charge, the temperatures gradually rise as carbonization proceeds; but in the charge they are more irregular, owing to fluctuations in the course of the changes taking place, and the want of homogeneity of the charge. The temperatures are higher farther from the mouth of the retort; hence 950° C. has been assumed to be the average temperature of the red-hot coke. The curves indicate that the charge is carbonized under the best conditions between 500° and 700° C.; but it is necessary that a higher temperature should be attained towards the end, in order that a quantity of heat may be stored in the retort, to be given up to the next charge, and that the interior of the charge may be properly carbonized.

When the coal is carbonized in four hours in the setting of seven retorts, the percentage of the total volume of gas evolved during each hour is shown in the following table for the five types of coal. The retorts were charged as rapidly as possible in succession, and the make from the whole setting taken for the calculation of the yields for each hour.

Percentage of the Total Volume of Gas Evolved.

Type of coal.	No. 1.	No. 2.	No. 3.	No. 4.	No. 5.
In 1st hour . . .	24·9	25·0	24·7	24·1	23·4
,, 2nd ,, . . .	29·9	28·4	23·2	29·6	26·9
,, 3rd ,, . . .	28 8	28·6	29·8	29·4	29·0
,, 4th ,, . . .	16·4	18·0	16 3	16·9	20·7

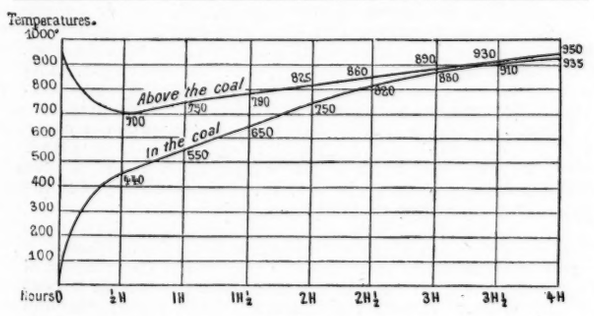


FIG. 12.

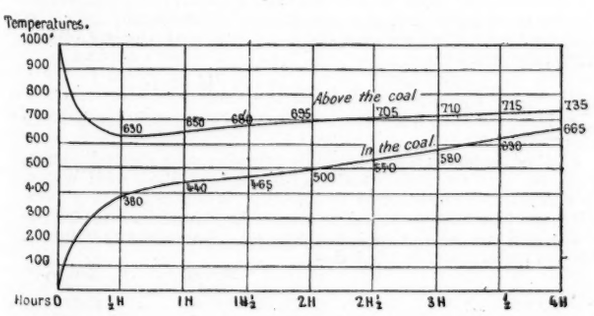


FIG. 13.

An exact comparison would entail the charges being of precisely the same weight for each type of coal; but as some types need more heat for their proper carbonization than others, uniformity of conditions would be attained with difficulty. Practically the simplest plan is to regulate the weight of charge so as to attain nearly uniform temperatures of carbonization.

The proportion of carbonic oxide and nitrogen in the gas produced at the different periods may be taken as nearly constant.

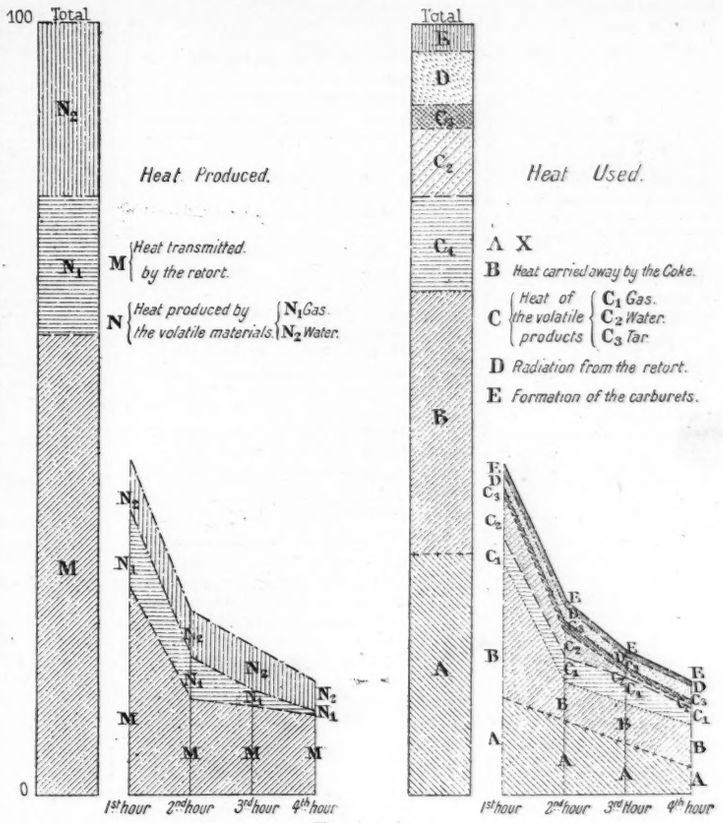

100
Total
0
Heat Produced.
M Heat transmitted by the retort.
N Heat produced by the volatile materials. N1 Gas. N2 Water.
Total
Heat Used.
A X
B Heat carried away by the Coke.
C Heat of the volatile products C1 Gas. C2 Water. C3 Tar.
D Radiation from the retort.
E Formation of the carburets.
1st hour 2nd hour 3rd hour 4th hour

FIG. 14.

The percentage by volume of the remaining constituents of the gas produced each hour is shown in the following table:—

Hour.	Carbonic Acid.	Hydrogen.	Marsh Gas.	Benzene.	Ethylene.
First . .	3·08	41·60	36·98	1·39	6·42
Second .	1·90	49·72	32·08	1·24	3·46
Third . .	1·40	57·52	25·98	0·84	1·72
Fourth .	1·08	58·64	23·72	0·25	1·12

The proportions by weight have been calculated, and the following table shows the gaseous products per hour for coal of Type No. 1 in parts (by weight) per 100 parts (by weight) of coal carbonized:—

—	1st Hour.	2nd Hour.	3rd Hour.	4th Hour.	Total.
Carbonic acid . . .	0·3534	0·2508	0·1868	0·0859	0·877
Carbonic oxide . . .	0·6310	0·6310	0·6310	0·6310	2·525
Hydrogen	0·2897	0·4023	0·4769	0·2941	1·463
Marsh gas.	2·1768	2·2633	1·8452	0·9226	7·208
Nitrogen	0·0950	0·0950	0·0950	0·0950	0·379
Benzene	0·3093	0·3245	0·2208	0·0394	0·894
Ethylene	0·4498	0·2858	0·1443	0·0572	0·937
Impurities.	0·1425	0·1425	0·1425	0·1425	0·570
Totals	4·4475	4·3952	3 7445	2·2677	14·853

The distribution of the tar and water over the period of carbonization was similarly studied; and the results for all the volatile matters were summarized. The following is the summary for coal of Type No. 3:—

Distribution by Weight of Volatile Matters during Carbonization.

—	1st Hour.	2nd Hour.	3rd Hour.	4th Hour.	Total.
Gas.	17·3	16·6	14·3	9·5	57·7
Water	12·3	7·3	2·9	1 0	23 5
Tar	10·1	5·3	2·8	0·6	18·8
Totals	39·7	29·2	20 0	11 1	100·0

Consequently, the numbers 40, 30, 20, and 10 approximately represent the quantities of coal decomposed per hour from the first hour to the fourth or last. During the last two hours, the tar and water which are produced are decomposed to a considerable extent into gas, owing to the higher temperature which then prevails—just as high heats give a large make of gas and a small make of tar.

From the foregoing observations, M. Euchêne proceeds to a discussion of the distribution of the heat produced and consumed at the different stages of carbonization. The following table

shows the results at which he arrives in respect of coal of Type No. 2:—

Heat Produced and Consumed (in Calories) per Hour per 100 Kilos. of Coal Carbonized.

—	1st Hr.	2nd Hr.	3rd Hr.	4th Hr.	Total.
Heat Expended.					
Formation of carbon compounds	1,126	643	365	148	2,282
Loss from retort mouthpieces, &c.	1,054	1,231	1,407	1,583	5,275
Volatile products at 650° C.—					
Tar	1,151	598	317	79	2,145
Water	2,775	1,655	647	233	5,310
Gas	2,558	2,706	2,503	1,457	9,224
Hot coke	13,000	3,856	4,192	4,525	25,573
Decomposition of coal	9,000	6,800	4,500	2,407	22,707
Totals	30,664	17,489	13,931	10,432	72,516
Heat Furnished.					
Volatile products—					
Water	5,727	3,416	1,336	480	10,959
Gas	4,662	4,532	3,798	2,277	15,269
Heat transmitted by wall of retort (by difference)	20,275	9,541	8,797	7,675	46,288
Totals	30,664	17,489	13,931	10,432	72,516

It is to be remarked (1) that the heat transmitted by the wall of the retort diminishes from start to finish, while the temperature within the retort increases progressively; and (2) that the total heat produced for the distillation of 100 kilos. of coal Type No. 2 amounts to 178,044 calories, while there is utilized in the retort only 72,575 calories; and hence there is expended externally 105,469 calories.

For three types of coal, the percentage of the total heat produced which is expended in the retort and externally is shown below.

	No. 2.	No. 3.	No. 4.
Heat expended in retort	40·8	42·3	44·5
„ „ outside the retort	59·2	57·7	55·5

The variations are due to the different quantities of heat produced by the formation of volatile matters. The distribution of heat during the four hours of distillation is shown graphically for coal Type No. 3 in fig. 14.

The study of the principal thermic reactions which take place in the distillation of coal for gas manufacture is now concluded, according to the programme drawn up. The limits of this programme might have been extended in several directions—in fact, there is an almost boundless field of research lying open on every side. The gas industry will benefit by such researches; for it is confronted by young and vigorous rival industries, with which it must strive armed with weapons of modern science.

HEATING AND COOKING BY GAS.

By M. Auguste Lévy.

[A Paper communicated to the International Gas Congress at Paris.]

The Paris Gas Company have already done much to advance the use of gas for heating by placing reliable apparatus for the purpose before their *clientèle* at a cheap rate. Apart from the trials they have themselves made, foreign makers have been permitted to carry on every possible investigation into their appliances, and been given every facility for the exhibition of apparatus for domestic or industrial heating by gas. While granting these favours to manufacturers, they have been at some pains to exclude any apparatus which, from improper design or construction, would give rise to dissatisfaction in regard to hygienic or other matters. To this end, they have specially set apart a department of the Landy laboratory for the examination of various types of apparatus. The tests thus made have been confined principally to the following points: Hygienic construction, complete combustion of gas, thermal efficiency, and reliable working properties.

The first experiments were made to ascertain the capacity of a heating appliance to discharge the products of combustion. The method consisted in an estimation of the proportion of carbonic acid in the air of the room in which the stove was used. The estimations were made by the volumetric method of titration, with a solution of baryta; the air being aspirated through a given volume, and the alkalinity of the solution tested before and after the precipitation of the barium carbonate. It was considered that all appliances which permitted the proportion of carbon dioxide to rise to 5 parts in 10,000 in ten hours were non-hygienic.

The completeness of combustion is of importance on financial as well as on hygienic grounds, although supposing combustion were incomplete there would be no real danger provided the removal of the products was properly allowed for. In testing, the apparatus is arranged without its outlet-tube; the burnt gas is allowed to escape into the room, and the air afterwards examined for carbon monoxide and hydrocarbons. These, as the combustion of the gas never gets very far away from completeness, must be looked for in very minute traces. For this purpose, Gréhant's process (based on the fixation of the carbon monoxide by the blood of a living mammal and the subsequent analysis of the gas given off by a sample of the blood from the carotid artery) can only be used by those who are physiologists. A second method worked out by M. Nicloux is better because colorimetric. In it, iodic acid is used to oxidize the carbon monoxide to carbonic acid; the liberated iodine representing the proportion of the former gas, and also of any hydrocarbons. The liberated iodine is absorbed in a solution of soda, to which is afterwards added potassium nitrite and sulphuric acid. The iodine is again liberated, and is taken up in 5 c.c. of carbon bisulphide. A comparative test on an iodide solution of known strength permits the iodine to be estimated colorimetrically. The test is delicate—showing one part of carbon monoxide in 40,000 to 60,000.

The tests on the thermal efficiency of a stove bear on the two questions: What number of heat-units are received per hour in the room? and How is this heat distributed—*i.e.*, what proportion is supplied by radiation, what by the heating surface, and what by the conduction of the walls? The efficiency is given by the formula $\frac{Q - P}{Q}$ where A = calories furnished by the heating surface; B, calories supplied by radiation; C, calories supplied by the walls of the stove to the surrounding air; P, calories lost in the products of combustion; and Q, total heat produced by the combustion of the gas. With gas of an average calorific power of 5300 calories per cubic metre, the efficiency of a stove burning n cubic metres should be $\frac{5300n - P}{5300n}$. The above factors are measured by the methods which are here described in outline.

Loss of Heat in Waste Gases.—Analysis of the waste gas (estimation of the carbon and hydrogen) gives us the volumes of air in excess of that required for combustion and of the burnt gas. If P be the weight in grammes of the water vapour in 1 cubic metre of the burnt gases, and p the water vapour in the same volume of the atmosphere supplying the stove with oxygen, it can be shown that the volume of gases produced by the combustion of 1 metre of gas is $\frac{1030 - 6p}{P - p}$; assuming that 1 cubic metre of gas produces 1030 grammes of water. Or a similar result can be obtained by applying the constant that 1 cubic metre of gas produces 600 litres of carbon dioxide. If a is the number of litres of carbon dioxide in 1 cubic metre of the products of combustion, $\frac{a}{600}$ gives the volume of gas consumed. With n cubic metres of gas per hour, the volume of the products of combustion is $\frac{600n}{a}$; and the air in excess, $6n\left(\frac{100}{a} - 1\right)$ (call this expression Y)

The loss of heat is calculated from the volume of (1) products of combustion and water vapour, and (2) excess of air. Since 1 cubic metre of gas gives 1·03 kilos. of water, of specific heat ·45, and 7·5 kilos. of carbon dioxide and nitrogen (specific heat, say, ·21) the heat lost in (1) is $[(7{\cdot}5 \times {\cdot}21) + (1{\cdot}03 \times {\cdot}45)]\ [T - t]\ n$; *i.e.*, $2{\cdot}04n\ (T - t)$, where T and t are the temperatures of the escaping gases and the outside air respectively.

As regards (2), the specific heat of air being ·2374, the corresponding heat will be $Y \times {\cdot}2374 \times 1{\cdot}293 \times (T - t) = {\cdot}3069\ Y\ (T - t)$. (One litre of air weighs 1·293 grammes.) Hence the heat lost is $(T - t)\ (2{\cdot}04n + {\cdot}3069\ Y)$; and the efficiency of the stove $= \frac{5300n - (2{\cdot}04 + {\cdot}3069\ Y)\ (T - t)}{5{\cdot}3n}$

The first table on p. 1147 gives some results by this method.

Heat of the Incandescent Zone.—The cast-iron plate is replaced by one of sheet iron, open in the middle, so as to form a rectangular channel, in which an anemometer is placed, and the speed of the current of hot air determined. From this speed, V, K, the sectional area of the channel, T and t, temperatures of the air at its outlet and the surrounding atmosphere, and c, the specific heat of air, we can calculate the heat thus produced from the formula:—

$$\frac{3600\ V\ K}{1 + a\ t} + c + 1 - 293\ (\text{kg.}) \times (T - t)$$

The heat obtained from this source is fairly proportional to the gas consumed.

Heat of Radiation is estimated by exposing, at a given distance, a copper globe coated with dead-black, and filled with water, in which a thermometer is immersed. When a constant temperature has been reached, a screen is placed in front of the globe, and the fall in temperature noted. Some results obtained by this method are appended—

	Nov. 20, 1896.	Nov. 30, 1896.
Gas per hour . . . . . litres	1232·0	1118·0
Distance of globe from stove . . metres	0·8	0·8
Temperature of the globe	49·8° C.	42·4° C.
„ „ room	32·2 „	24·0 „
Heat per hour on burning gas (= Q) . cal.	6529 0	5925·0
Heat radiated per hour (= R) „	775 0	773·0
Ratio of heat radiated to total heat (R/Q) per cent.	11·5	13·0

Remarks.—The appliance used was the Company's radiant stove, No. 2. In the first experiments, the radiant surface was composed of refractory earth covered with flexible asbestos, with grating. In the second, the grating was removed.

Apparatus.	Sectional Area of Flue.	Gas per Hour.	Atmospheric Pressure.	Temperature of Surrounding Air.	Temperature in Main at Time of Test.	Products of Combustion in 6 Litres.		Volume of Products of Combustion per Hour.	Water in 2 Litres of Surrounding Air.	Heat per Hour.	Heat Lost per Hour.	Efficiency.
	Square Centimetres	Litres.	Millimetres	OC.	OC.	Gr. CO_2.	Gr. H_2O.	Cub. Met.	Gramme.	Calories.	Calories.	..
Company's Stove—												
No. 1	S = 900	800	760	19	150	0·081	0·123	60	0·015	4240	2696	36 p. ct.
„ ID. . . .	150	800	760	20	170	0·124	0·150	40	0·015	4240	1930	54 „
„ ID. . . .	75	800	755	21	190	0·177	0·181	28	0·010	4240	1542	63 „
„ ID. . . .	24	800	765	23	210	0·282	0·298	18	0·013	4240	1333	68 „

Apparatus and Date of Trial.	Hourly Consumption.	Pressure.		Temperature.			Speed of Vapours.	Volume per Hour of Vapour in the Flue.		Heat Produced.	Heat Lost.	Efficiency Per Cent.
		Gas.	Atmosphere.	Outside.	In the Room.	In the Sheet-Iron Flue.		At T°.	At O°.			
		Mm.	Mm.	°C.	°C.	°C.		Cub. Met.	Cub. Met.	Cal.	Cal.	
Radiant stove, No. 1, square (March) .	562·50	20	..	..	20·0	148	2·150	21·887	14·18	2981	562	81
	720·00	30	..	..	20·0	176	2·400	24·432	14·84	3816	717	81
	857·14	40	..	..	16·0	190	2·570	26·113	15·39	4543	830	82
	972·97	50	..	..	18·0	204	2·880	29·318	16 75	5157	950	81
Same, but circular (April)	318·58	20	..	..	15·0	120	1·500	15·270	10·60	1688	326	80
	375·00	30	..	..	16·0	130	1·500	15·880	10·70	1988	354	82
	401·64	40	..	..	17·0	140	1·650	16·800	11·00	2447	420	82
	537·31	50	..	..	16·0	153	1·740	17·713	11·00	2848	468	83
No. 1 circular stove (April)	860 00	20	763	22	30·5	77	0·615	200·000	155·00	4618	2232	51
	1090·00	30	767	18	33·5	89	0·620	201 000	151·00	5777	2598	55
	1250·00	40	763	12	32·0	92	0·730	236·000	176·00	6625	3274	50
	1410·00	50	755	20	32·5	93	0·690	223·000	166·00	7632	3084	68

Conduction from the Walls of the Apparatus is not easy to estimate directly; but it can be obtained, by difference, from the equation $Q = A + B + C + P$ (see above).

A simple method of ascertaining the efficiency of a stove depends on the anemometer, and consists in determining the speed of the products of combustion at some given point in the outlet-flue—calculating therefrom the hourly consumption (by multiplying the speed by the sectional area), and afterwards finding the heat carried off in this way from the temperatures, T and *t*, of the products of combustion and of the surrounding air. The results, though not exact, are useful. We obtained 2696 by analysis, and 2400 by the anemometer, for a stove of No. 1 size, as supplied by the Paris Gas Company.

As regards draught, it will be readily understood that the heat withdrawn with the spent gases increases with the speed of the same. The wisdom of reducing the draught is seen by the table already given. The efficiency of the stove is increased from 36 to 68 per cent. by reducing the sectional area of the flue from 900 to 24 square centimetres. The proper working of the apparatus sets a limit on this procedure. With too small an area of flue, the proportion of carbon dioxide in the air rises to more than the permissible quantity.

The tests of the good working of the appliances in practice include: (1) The determination of the hourly consumption of gas at all pressures (differing by 10 millimetres) between 10 mm. and 100 mm. of water; (2) lighting and extinction; and (3) special advantages of a given apparatus over others of like kind. These practical trials were made in two identical rooms, in one of which was an apparatus for comparison. They were carried on for eight or ten days; and a mean was taken of the results. During this period, the temperature of various points in the heated apartment was noted, from the results of which, when plotted on a diagram, a good idea was obtained of the distribution of heat by a stove.

The stoves usually employed may be classified into: (1) "Log-fires," (2) reflectors, (3) coke-fires, (4) radiating.

(1) This type—first made by Bardot, of Lyons—possesses a very low efficiency, although for some years past this has been improved by placing the "logs" in a sheet-iron enclosure so as to produce an increased circulation of air.

(2) In these, a cylindrical parabolic plate is used to reflect the heat rays from the upper part of the stoves—*i.e.*, the part consisting of a mass of white flame. Like other similar appliances, they require the gas-outlet to be of certain given proportions if combustion is to be complete, and they give rise (especially on lighting) to a deposit of soot. The relations between the heating power and the air supply in this type of stove are such that to increase the former so as to meet the requirements of a given sized room means that the space required for the latter makes the stove too large for the flue intended for its reception. In the Wybauw stove, the regenerative principle has been applied.

(3) These stoves present the appearance of a coke-fire, and their efficiency is better than those of the preceding classes. They have the disadvantage of containing so much refractory material that they do not heat until fully in action; and moreover they emit a rather unpleasant odour when lighting up.

(4) Immediate heating on lighting up is obtained with stoves of the radiating type. The ideal conditions are: A radiating surface of small mass and low conductivity, and as high a temperature as possible. In the models of the Paris Gas Company the radiating surfaces are composed of asbestos fitted on vertical plates of some refractory earth, on which the flames play. The asbestos is thus raised to incandescence on lighting up, and heating by radiation commences at once. In the first models made by the Company, the air on entering was heated by the spent gases on their way to the outlet; but, with a view to increase this preliminary heating of the air supply as much as possible, the spent gases are now led into a chamber of thin wrought iron, around which the entering air circulates. The results obtained with several of the Company's burners are given in the second of the above tables.

These results were obtained without artificial draught—that is, the gases were discharged into the atmosphere simply through a sheet-iron tube, 1·5 metres in height. The conditions being the same throughout, the figures in the last column are comparable, and show whether one apparatus is better than another as regards the interior circulation of hot gases. They thus serve as a guide to the manufacturer, but are very different from practical figures obtained when the apparatus is fixed in the chimney-place of an apartment. Under these last-mentioned conditions, the efficiency of the radiating stoves is much lower, although the "calorifers" do not lose much; in fact, they may even give results exceeding those in the table.

The comparison of these different types of stove shows the actual progress made in this direction during the past few years. The principal advantage of this mode of heating is the ease of regulation—a point which the Company have endeavoured to turn to account in a device whereby some gas would be shut off when the room reached a certain temperature. Two regulators of this kind have been devised by Dr. Roux and M. Dorian, and have been tested by the Company. Both have given good results; but the former is applicable only to the regulation of temperature in small spaces, such as drying ovens, &c.

The use of gas for cooking is, of course, familiar to everyone. The public do not, however, seem to be awake to the importance this agent has assumed in restaurants, where more extended and varied assistance is derived from it every year. In their endeavours to place the use of gas for this purpose upon as satisfactory a basis as possible, the Company have been assisted by specialists, such as MM. Driessens, Colombié, and others. The installations placed in the large restaurants (with the permission of the proprietors) have shown us the faults which must be corrected; so that to-day we can exhibit a large number of appliances which leave nothing to be desired.

The cooking of food is done: (1) In a saucepan or digester; (2) over the naked fire; or (3) in an oven. Gas can be used in all these methods. In the case of (1), cooking is done more rapidly than with coal; in (2) the gas-grill replaces the wood or charcoal fire; and in (3) the gas-heated oven is more uniformly heated than is possible with coal.

Much discussion has taken place on luminous *versus* non-luminous flames for cooking purposes. The latter are used in all the Company's apparatus. As regards transmission of heat, the bunsen flame is not so suitable for the grill as the luminous flame, because the latter can be made longer. For the same consumption of gas, a series of luminous flames give a heating surface much greater than that produced by bunsen flames; but an even better result can be obtained with the latter by using them on the radiation system, and also to heat a plate of refractory earth or cast iron which would, in turn, radiate heat.

For domestic use, the most suitable apparatus is the stove with two burners, horizontal fitting, and a dripping pan permitting of a small piece of meat being roasted. In all, some 315,000 of these appliances are in use in Paris. They are supplied free by the Company. In them the direct burners are

always of the bunsen type, while in grills luminous flames are generally used—this construction permitting of a simpler and cheaper apparatus.

The installations for cooking in restaurants include the large apparatus known as the "Saucier-entremettier," for the cooking of foods in saucepans, &c. The whole top of this stove is hot. It can even be made red-hot (when coal is used). It is employed for certain methods of cooking only. The surface is flat all over, so that heavy vessels can be easily moved about; and in the lower parts of the apparatus (between the fires), there are ovens for roasting purposes. Hot-water reservoirs are placed above the level of the saucepans for convenience in filling. Frying, roasting, and grilling appliances are provided, as are also apparatus for cleaning plates, &c., warming dishes, heating coffee, milk, &c., in their appropriate vessels.

Up to 1893, scarcely any use was made of gas for cooking in Paris, until the Company made a big roaster for a large casino. In this, the spits were replaced by a grill on which the joint to be cooked was laid. This plan of cooking retained the juices in the meat much better. The same apparatus was arranged to heat water for the use of the kitchen; and the roasters and ovens were lined with refractory materials—two advances in gas cooking appliances. In 1898, the Company entered upon a very active period in the application of gas to cooking. They constructed a large double roaster for the Ecole Polytechnique,* where comparative tests were made, which showed that the loss in weight of meat during cooking with gas was only 20 per cent., as against 30 per cent. with the wood previously in use as fuel. A cooker of still larger dimensions was made in 1899 for the Grands Magasins du Bon Marché. It was 4·25 metres in length, 0·8 metre deep, and 1·65 metres in height. This was followed by two large appliances which the Company named "La Salamandre" and "La Grillade-Braisière." The first was much used for the preparation of toasted bread. In the second apparatus, the meat was heated from below, under the eyes of the cook, just as in heating on the coals, which were replaced by an arrangement of small fragments of refractory earths heated to redness by the gas.

Roasting and grilling having been thus provided for, the Company proceeded to design a cooker to take the place of the "Saucier-entremettier" above described. This they were able to do by means of (1) large burners 40 centimetres in diameter, placed under gratings shaped like a St. Andrew's cross, and alongside these smaller burners served to heat saucepans and other vessels of lesser size; (2) hot plates placed between the large burners and heated from below by the waste heat from the ovens.

At present, thirty establishments in Paris are using cooking appliances made by the Paris Gas Company. Special mention should be made of the Restaurant Fouquet, No. 99, Avenue des Champs Elysées, which has placed a gas-cooker in the public dining-hall. The apparatus interests visitors; and owing to the excellent ventilation, it does not give rise to any inconvenience.

Preserving and Fireproofing Wood.—The following is a German method of effecting the above objects: Subject the wood for six to eight hours to the boiling heat of a solution of 33 grammes of manganese chloride, 20 grammes of orthophosphoric acid, 12 grammes of magnesium carbonate, 10 grammes of boracic acid, and 25 grammes of ammonium chloride in 1 litre of water. The wood thus treated is said to be perfectly incombustible, even at great heat, and to be also protected by this method against decay, injury by insects, and putrefaction.

Southern District Association of Gas Engineers and Managers. We learn from the circular issued by Mr. J. W. Helps, the Hon. Secretary of this Association, that the business for the meeting on the 15th inst. will, as usual at the last gathering of members in the year, consist of the election of the President and office-bearers for the ensuing twelve months, and, in addition, the reading of the following papers: "Purifier Construction," by Mr. G. P. Lewis, of Lower Sydenham; "Difficulties Met With in the Construction of a Concrete Gasholder Tank," by Mr. F. G. Cockey, of Newport (I.W.); and "High-Pressure Gas for Incandescent Lighting," by Mr. A. W. Onslow, of the Royal Arsenal, Woolwich.

Re-Burning Damaged Portland Cement.—According to an article by Mr. R. W. Egerton in "Indian Engineering," the following process has been successfully adopted for re-burning cement: The damaged cement was set solid to the centre of the barrels in most cases. It was broken into pieces small enough to pass through a 3-inch ring, and placed in one end of a horizontal semi-cylindrical furnace, 15½ feet long and 4 feet wide. A fire of dust coal was kept up at the other end. When the cement was clinkered, it was cooled and ground in a mortar-mill to pass a screen of 1600 meshes to the square inch. If used fresh, this cement heated when slaked; but the trouble disappeared after weathering for 15 to 20 days. Two more furnaces of this sort were built as soon as the first trials proved successful; and later a kiln like those for burning lime was erected. The body was about 3 feet in diameter inside at the top, 8 feet at the bottom, and 8 feet high; the thimble or lower frustum being 6½ feet deep. The cement re-burnt in this way was about one-third as strong as the uninjured material.

* This appliance was described and illustrated in the "JOURNAL" for Feb. 27, p. 541.—ED. J.G.L.

TECHNICAL RECORD.

COKE-OVENS AS GAS-WORKS.

Dr. H. Wiechell has contributed an interesting article, on the "Application of the Surplus Gas from Coke-Ovens to Illuminating Purposes," to a recent number of the "Journal für Gasbeleuchtung." He refers to recent papers on the subject—such as those reported in the "JOURNAL," Vol. LXXIII., pp. 364 and 1213, and Vol. LXXIV., pp. 176, 1114, and 1176—and he then proceeds to examine the financial aspects of the question.

He points out that the coke-oven processes, which have been discussed in the papers quoted, must be regarded not merely as means of affording the highest return from the coal, but also as a basis for simplification and economy of manufacture. For equal production of gas, the oven plant required costs considerably less than retort plant, while manual labour is reduced to a minimum, and thus the cost of operating oven plant is lower. But if the results obtained in American installations are applied to German coal supplies (taking account of the difference in quality), it will be found that there is not the same large surplus of gas available. For instance, the surplus gas from Otto-Hoffmann ovens dealing with Westphalian or Saar coal would on the average be less by more than 10 per cent. than the surplus gas from American coal from the Connelsville district. Upper Silesian coal would give better results; but even that is not so rich a gas coal as is the American coal. But technical progress lies in the direction of the utilization of less rich gas coal, and in the partial or complete abolition of the use of enriching coals. The necessity for the application of varieties of coal selected for their gas-making properties should be wholly or partially done away with.

Gas from well-managed coke-ovens closely resembles that from gas-retorts. According to data published in "Stahl und Eisen" in 1895, the calorific power of Cologne gas made from Westphalian coal was to that of the gas made in Otto-Hoffmann coke-ovens from the same coal as 100 : 95. The calorific power of Cologne gas, moreover, agrees closely with that of the gas made in America from the coal in use there. The calculation given below shows that the heating effect of the gas used in heating coke-ovens is equal to, or better than, that produced from coal or coke for heating retort-settings. An illuminating power of from 14 to 18 candles is found in the rich gas which is produced during the first third of the whole period of distillation. Suitable working of the ovens, with a shortened period of distillation, and distillation chambers of smaller size, which would result in the more rapid extraction of the gas and consequently better preservation of the illuminants from destruction, would have the desired effect of wholly or partially abolishing any necessity for carburetting the gas. The yield of coke is closely dependent on the duration of the period of distillation. It is greater the less thorough the carbonization. In places where foundry coke is not required, and only household coke has to be supplied, coke suited to the local requirements could be produced along with gas of higher illuminating power. Evidently, the financial results must depend on the adaptation of the coke to the market demands, and on the working and the choice of coal being regulated according to the relative amounts of gas needed for illuminating or for heating and power purposes. The coke-oven process admits of considerable modifications to suit varying requirements; and thus its ultimate value for gas-works purposes is really very high.

In order to form an idea of the returns which such an installation would afford, a general glance may be taken at figures computed for an equal quantity of gas from gas-retorts and coke-ovens. It will be assumed that the same coal would afford the same yield of gas, coke, tar, and ammonium sulphate, and that gas coke would fetch the same price as foundry coke, especially as an entire production of the latter by the coke-ovens is not contemplated. The prevailing average prices of the products are taken; and the calorific power of the gas in each case is assumed to be in the aforementioned ratio. The cost of the plant in each case is estimated as closely as possible, and includes the carbonizing, condensing, washing, and purifying plant, and gasholders. Where coke-ovens are engaged in producing illuminating gas, benzol-recovery plant will be needed at the most for one-half or two-thirds of the gas made—that is, for the gas used for heating purposes. Thus the benzol-recovery plant will be on a smaller scale than for coke-ovens where the whole of the gas is dealt with in it. But, on the other hand, cyanogen washers will be needed for carrying out Bueb's cyanogen-recovery process. Therefore, the cost of the whole plant may be estimated at that of benzol-recovery plant of a capacity adequate to deal with the whole of the gas made. An Otto-Hoffmann oven, completely equipped for the recovery of tar and ammonium sulphate, costs £650; or, allowing £250 also for benzol-recovery plant, a total of £900. In twenty-four hours, such an oven would work off 3½ (metric) tons of coal, yielding 10,065 cubic feet of gas per metric ton (= 10,227 cubic feet per English ton), and 70 per cent. of its weight of coke, 3½ per cent. of tar, and 1 per cent. of sulphate of ammonia. Messrs. Otto also find the yield of cyanogen is equivalent to 1·5 oz. to 1·8 oz. of potassium ferrocyanide per 1000 cubic feet; but this yield will probably be considerably exceeded. Benzol is not taken into account, as it will merely

diminish the cost of producing carburetted gas, and thus be so much to the good. One Otto-Hoffmann oven would produce in twenty-four hours 35,300 cubic feet of gas, of which 40 per cent. would be surplus available for disposal. For instance, for an output of 706 million cubic feet (20 million cubic metres) of gas per annum, an installation of 135 ovens would be required. This would cost, including benzol-recovery plant, £121,500. To this must be added the cost of a gasholder—say, £75,000—making a total of £196,500.

The cost of retort plant capable of making the same volume of gas would (including a similar gasholder) be £225,000; or £28,500 more than the coke-oven plant. The selling price of the gas, regarding it as sold for heating purposes, whether it be actually used for lighting or heating, would be about 3s. 5d. per 1000 cubic feet (12 pf. per cubic metre). The retort plant on this basis would bring in £120,000 per annum; but the gas from the coke-oven plant, having only 95 per cent. of the calorific power of the retort gas, would accordingly fetch only £114,000. Nevertheless, the gas revenue from the oven installation would amount to 58 per cent. of the capital outlay; that from the retort plant to only 53·33 per cent. Consequently, the ovens return, for gas disposed of, 4·67 per cent. more on the capital outlay than do the retorts.

Even more striking are the differences in the revenue from bye-products and in the cost of coal. The 706 million cubic feet of gas would be obtained in retorts from 70,000 metric tons (= 68,880 English tons) of coal. The make of, and the returns from, bye-products would be as follows:—

Product.	Percentage of the Weight of Coal Carbonized.	Quantity Made. Metric Tons.	Price per Metric Ton.	Receipts.
Coke . . .	70·0	49,000	£0 15 0	£36,750
Tar . . .	3 5	2,450	1 0 0	2,450
Sulphate . .	1·0	700	12 0 0	8,400
Potassium ferrocyanide	(4 oz. per 1000 cub. ft. of gas*)	80	57 10 0	4,600
			Total . . .	£52,200

* According to Dr. Bueb's results.

The coke-ovens, on the other hand, would have to carbonize 175,000 metric tons (= 172,200 English tons) of coal in order to yield a surplus of 706 million cubic feet of gas. Thence it follows that the remaining products would give receipts as shown in the next table. The figures assume the yields and prices as for the retort products, with the exception that it is reckoned that cyanogen is recovered from the whole of the gas produced—viz., about 50 million cubic metres (= 1766 million cubic feet), and that the yield is as found by Messrs. Otto—viz., 1·5 oz. of potassium ferrocyanide per 1000 cubic feet.

Product.	Quantity Made. Metric Tons.	Receipts.
Coke.	123,000	£92,250
Tar	6,120	6,120
Sulphate of ammonia .	1,750	21,000
Potassium ferrocyanide .	75	4,312
	Total . . .	£123,682

These figures show that the gross receipts from the bye-products are approximately proportional to the amounts of coal carbonized—viz., as 4 (retort plant) is to 9·48 (coke-ovens). Deductions for materials, and the cost of recovering and working up the bye-products, are not to be taken into account here, as this is only an attempt to show the relative receipts. The expenses are less, the greater the quantity dealt with. The charges for quenching, transporting, and loading the greater quantities of coke produced in the coke-ovens, are considerably less per unit, owing to simplification of working by mechanical means. In the Boston plant, the ovens are erected in a high position; so that the coke, as it is drawn from the ovens, falls down an inclined plane, on which it is quenched, directly into the waggons which are ready for its reception. Further, there must be taken into consideration the relative efficiencies of the gas used as fuel in the ovens and of the fuel consumed in heating the retort-settings. For their carbonization in gas-retorts 100 parts by weight of coal require, on a favourable estimate, 15 parts by weight of coal, or the equivalent thereof. In Otto-Hoffmann ovens a (metric) ton of coal is carbonized by the consumption of 6040 cubic feet of the oven gas, which, according to figures given in "Stahl und Eisen" in 1892, would be equivalent to 0·1496 (metric) ton of coal, or 14·96 per cent. of the weight of coal carbonized. This is practically the same as the percentage of coal (15) used for heating retorts. But other estimates give a much higher relative heating value to the coke-oven gas; and consequently the figures might be made more favourable to the coke-ovens.

At times of great demand for gas, when the surplus proved insufficient, producer gas might be used as a good and cheap auxiliary for heating the ovens. The foregoing deals only with Otto-Hoffmann ovens on the regenerative system. Undoubtedly, however, Otto ovens with direct firing would give equally good results, taking into consideration the special circumstances of each case. If the surplus gas proved considerably less than the quantity contemplated above, the gas would have a correspondingly higher illuminating power.

Coke-oven installations such as that considered would be applicable in the cases of towns of moderate or large size. An installation of sixty Otto-Hoffman ovens would serve to supply a town of 80,000 to 100,000 inhabitants. The foregoing statement of returns would (says the author) lead to the anticipation that such gas-works have an unquestioned future in Germany.

ESTIMATION OF SULPHURETTED HYDROGEN IN GAS.

The following is an account of a method of estimating sulphuretted hydrogen in illuminating gas, devised by Herr A. Müller of Völklingen, and described by him in a recent number of the "Journal für Gasbeleuchtung."

The method is essentially the same as that of estimating sulphur in iron which was recommended by Schulte in 1896. Two solutions are required—one of 25 grammes of cadmium acetate with 200 c.c. of acetic acid, made up to a litre with distilled water; the other of 80 grammes of crystallized sulphate of copper dissolved in 750 c.c. of distilled water, to which (on cooling) 175 c.c. of concentrated sulphuric acid is added, and the whole made up to a litre with distilled water and filtered. Then 25 c.c. of the cadmium solution is brought into an Erlenmeyer flask provided with a plug with two perforations, through one of which passes an inlet-tube extending nearly to the bottom of the flask, and through the other of which passes an outlet-tube with end open to the air. The volume of gas passed through the solution is measured either by means of an experimental meter, or a bottle of which the capacity down to a given mark is exactly known and is about 15 litres (530 fluid ounces, or 0·53 cubic foot). The bottle should have a tubulure at both top and bottom, and the water in it should have its surface covered by a layer of petroleum. Gas is admitted through the upper tubulure, and the water is allowed to escape through the lower one until it reaches the level of the mark on the bottle. The Erlenmeyer flask is then connected with the upper tubulure of the bottle, to the lower tubulure of which a water reservoir or service-pipe is connected. The cocks at both tubulures are opened, so that the gas contained in the bottle is driven in a slow stream through the cadmium solution in the flask. There is no risk of sulphuretted hydrogen escaping absorption. A second absorption flask will be found to absorb no more.

After the gas has been passed through the solution, the plug of the Erlenmeyer flask is removed, the inlet-tube is rinsed out into the flask, and the contents of the latter are heated to about 120° to 140° Fahr., and 10 c.c. of the copper sulphate solution is added. The cadmium sulphide and the copper sulphate at once react, causing a change of the yellow colour of the precipitate suspended in the liquid to a dark brown. The copper sulphide formed is filtered off, washed well with hot water, dried, ignited, and weighed. The copper sulphide is far more easily washed than is cadmium sulphide. The reactions involved are—

Sulphuretted Hydrogen. Cadmium Acetate. Cadmium Sulphide. Acetic Acid.

(1) $H_2S + Cd(C_2H_3O_2)_2 = CdS + 2C_2H_4O_2$

Cadmium Sulphide. Copper Sulphate. Copper Sulphide. Cadmium Sulphate.

(2) $CdS + CuSO_4 = CuS + CdSO_4$

Copper Sulphide. Oxygen (from the air). Cupric Oxide. Sulphur Dioxide.

(3) $CuS + 3O = CuO + SO_2$

Thus a molecule of sulphuretted hydrogen yields a molecule of cupric oxide. Consequently the weight of sulphuretted hydrogen absorbed is equal to $\frac{34}{79}$ times the weight of cupric oxide obtained. The weight of a litre of sulphuretted hydrogen at 64° Fahr., which may be assumed for the purpose of this calculation to be near the usual temperature, is about 1·43 grammes. Therefore, if the weight in grammes of cupric oxide obtained is multiplied by $\frac{34}{79 \times 1{\cdot}43} = 0{\cdot}301$, the result is the volume (in litres) of sulphuretted hydrogen in the volume of gas employed under the prevailing pressure.

Wood Gas for Public Lighting.—The public buildings of Petersburg, South Australia, have been lighted by gas made from wood; and the result is reported to have been so satisfactory that this illuminant is to be used for the streets. It costs about 5s. per 1000 cubic feet. The charcoal resulting from the carbonization of the wood is a valuable residual; and there is a certain yield of tar.

Midland Association of Gas Managers.—As already announced, the autumn general meeting of this Association will be held at the Grand Hotel, Birmingham, next Thursday; and we learn from the circular which the Hon. Secretary (Mr. C. Meiklejohn, of Rugby) has issued that Mr. J. Ferguson Bell, of Derby, the President, will read a paper on "Standardizing Meter-Unions." This will be the only technical matter to be brought before the members.

REGISTER OF PATENTS.

Explosion Engines.—Johnson, C. M., of Redhill. No. 15,633; July 31, 1899.

The patentee proposes to use one or more balanced piston-valves outside the cylinder of the engine, to regulate the admission of the explosive mixture and the expulsion of the products of combustion resulting from the exploded charge after it has performed its work. The invention further consists in constructing and operating the piston-valves so that, if it is desired to obtain an explosion at each end of the cylinder, the valves are so adjusted and operated (by either a crank, cam, eccentric, or other device) that they are always tight and seated to prevent the flow of gases except when they are travelling over the port out of the piston-valve chamber. By this means, it is possible to dispense with the noise and pounding of ordinary explosion-engine valves, and to run them at much greater speed, and, if desired, in either direction.

The invention also consists in mechanism attached, when wished, to any of the moving parts of the engine (or a part connected thereto), for the purpose of storing up power which may be utilized when desired to start the engine in either direction—thus avoiding the manual labour and inconvenience necessary to start an ordinarily constructed explosion engine.

Internal Combustion Engines.—Mitchell, E. A., of West Norwood, S.E. No. 20,163; Oct. 7, 1899. Date claimed under International Convention, March 8, 1899.

The object of this invention is to provide an engine in which a working stroke may be given to the piston once during every revolution of the crank-shaft without the use of a force-pump for compressing the motive fluid, as commonly employed in engines of this type. The patentee provides a closed chamber, in which the motive fluid is under pressure; and the pressure which he contemplates making use of is that occasioned by the production of combustible gas in a confined space—as, for instance, by the action of dilute acid on granulated zinc, or by the action of water upon a combination of calcium and hydrocarbon, or upon calcium carbide or any other similar compound.

Gas-Burners.—Wilkinson, J., of Burton-in-Lonsdale. No. 20,690; Oct. 16, 1899.

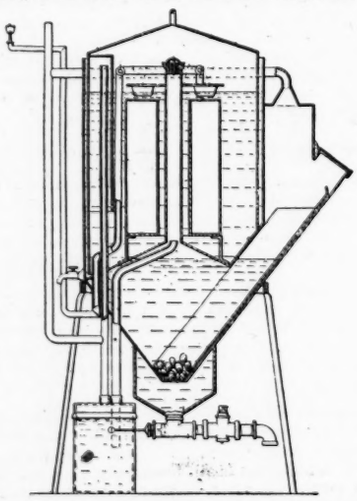
This invention relates to gas-burners particularly applicable for gassing silk and other fibres. In the burner preferably used for this purpose, the body of the burner has a recess formed around the supply-orifices; and a cover or hood (preferably square), with a downwardly projecting rim, is provided. The cover tends to return the flame, and concentrate the heat; and it also prevents carbon deposit from the burnt fluff. The side and ends of the burner are left open, to facilitate the passage of the fibres, and to allow of its being moved out of contact with them. In place of the hood, an auxiliary vertical downward pipe may be employed, causing two jets to meet on the fibres; or a series of such pipes may be arranged at any suitable angle, so as to cause three or more flames to concentrate on the fibres.

When it is required to adapt for lighting purposes the gas produced for heating, a flat box-burner is employed, with a series of holes or perforations, and a cover for concentrating the flame, over which is fixed a "carbon comb."

Acetylene Generator.—Ross, W., of Montreal, Canada. No. 22,828; Nov. 15, 1899.

This invention has for its objects: To supply absolutely pure acetylene to the consumer; to enable all the air that may happen to gather in the apparatus to be exhausted before any gas can flow; to provide an automatic feed of the calcium carbide as the gas-generating power of the apparatus diminishes; to provide a gasholder that will be capable of containing a comparatively large supply of gas—thus necessitating a long seal, and at the same time enabling the gas when generated to pass through, and free itself only from, the amount of water necessary to its generation; to provide an apparatus that can be carried from place to place without any danger of its parts becoming disarranged; and to "further improve the general construction of this class of apparatus."

The cylindrical-body portion of the apparatus has (as shown) a pair of oppositely arranged truncated cones, connected at their bases to the bottom

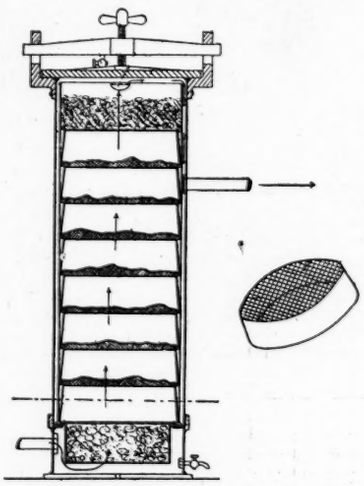


edge, and forming the generating or decomposing chamber. Openings are cut through the cylindrical-body portion and the upper cone; and the edges of the openings are connected by a diaphragm, forming a passage. A chamber, constituting a shoot, is formed on the exterior of the body portion, and has an opening (corresponding to the openings cut in its side) to receive a drawer, to slide into the passage; the drawer having its inner end formed of wire mesh, so as to close the open end of the cone, and act as a false bottom to the generating or decomposing chamber. The drawer carries the quantity of carbide being used at any one time; and the passage serves as a port through which the chamber can be supplied with water. A gas-conducting pipe is connected to, and leads from, the truncated apex of the upper cone, to a point on a level with the upper end of the cylindrical-body portion. A cylindrical section—constituting a well to receive the residue, and having a conical bottom—is secured to the lower cone; and the bottom of this well is provided with a draw-off pipe furnished with a piston, to enable it to be cleared in case it becomes clogged. A dome or gasholder, about equal in length to, and slightly less in diameter than, the cylindrical-body portion, is placed within the body portion; a water-seal serving to retain the gas fed to the interior.

Purification of Acetylene.—Bailey, J. W., and Clapham, J., of Keighley. No. 23,073; Nov. 20, 1899.

In the production of acetylene from calcium carbide which is only commercially pure, it is found (the patentees point out) that a certain amount of impurities—such as aqueous vapour, sulphuretted and phosphoretted hydrogen, and the like—are given off along with the gas; and if allowed to remain present in it, they "considerably affect the illuminating power of the gas, have a deleterious action on most of the metals employed in connection with its conduction and combustion, and otherwise seriously interfere with its successful use." The invention consists in means whereby the impurities may be entirely or to a certain extent removed.

For this purpose, the patentees employ a case or holder (as shown) of circular or other shape in cross section; and inside this is mounted, at a suitable distance from the lower end, a container having a perforated bottom, and holding a quantity of slag wool or other similar substance. Above the container, and reaching to within a short distance of the upper end of the



outer vessel or holder, is an open ended cylinder or case, placed in such a manner that its lower end forms a gas-tight joint with the container for the slag wool. Within the cylinder is a tray, perforated or formed of trellis work; and above this is a receptacle or bag formed of some porous material, and containing calcium chloride or other purifying agent—the bag being made to fit tightly against the sides of the inner receptacle. Above the bag is placed another perforated tray; on this another receptacle; and so on, until there is a series of trays and receptacles. Above the uppermost receptacle is superimposed another perforated tray, on which is placed slag wool or a layer or sheet of cotton wool. The outer casing is covered by a lid.

The inlet and outlet pipes for the acetylene are so formed that the gas is caused to travel first through the container in which is placed the slag wool—the gas by this means being split up, and any solid particles removed from it; then through the series of receptacles containing the calcium carbide or other purifying agent; and finally through the remaining layer of slag wool. If desired, the gas may be further passed over or through lime, or a solution of caustic soda or caustic potash, to remove any traces of chlorine remaining after its previous treatment.

Mixing Gas and Air or Gases of Different Gravities.—Cottrell, G. R., of New York, U.S.A. No. 4381; March 7, 1900.

This invention relates to apparatus "for mixing gas and air, or gaseous fluids of different gravities, in the desired proportions, under the same pressure or velocity, and thereby obtain a perfectly homogeneous mixture of the gas and air, or other fluid, at a moderate pressure, for supplying the burners of heating and cooking stoves, and for other purposes."

In burning gas for such purposes, it is now a common practice, the patentee remarks, to supply the current of gas to the burner-orifice at a comparatively high velocity, by means of an induction burner of the bunsen type—thereby drawing in, or inducing the flow of, a current of air at a low velocity, for mingling with the gas to cause combustion. The results attained in practice are unsatisfactory and wasteful of gas, for the reason that the currents of gas and air, moving at different velocities, and the fluids being of different gravities, do not diffuse and perfectly commingle, but, on the contrary, are held apart by "a great law in Nature," resulting in imperfect and only partial combustion of the carbon particles and a corresponding waste of gas. Gases of different gravities (such as gas and air) "must be united in positive measured proportions, and also at the same velocity, so that when they are brought

together the mixture will be perfect and homogeneous, and in uniform proportions."

The object of the present invention is to provide for overcoming such defects and objections in the gas and air mixing devices, and to provide for mixing together currents of gas and air under a uniform pressure and at the same velocity, and in positively measured proportions. Accordingly, the air-meter drum and the gas-meter drum are mounted upon the same shaft (as shown), and the pressure of gas is utilized for revolving the gas and air drums. One of the special objects of the invention is to

Fig. 1.

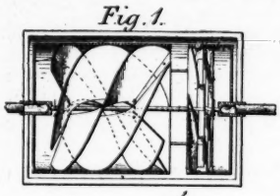


Fig. 2.

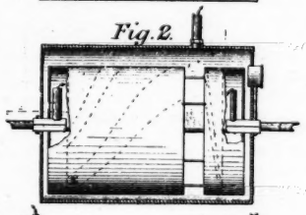


Fig. 3.

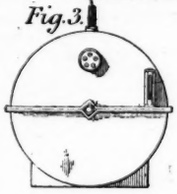
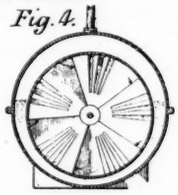


Fig. 4.



reduce to a minimum the resistance to the revolution of the drums by providing comparatively narrow or small inlet-openings to their screw-measuring compartments, and comparatively wide or large outlet-openings. Another object is to provide increased and more efficient driving surfaces or shoulders in the spiral vanes of the gas-meter drum, so that the drum shall be more readily and effectively propelled by the pressure of the gas which is to be metered and mixed with the air. Fig. 1 represents a horizontal section of the casing and meter-drums, excepting that the vanes in the drums are shown in plan. Fig. 2 is a vertical longitudinal section of the casing, with the meter-drums in elevation, and illustrating (diagrammatically, by dotted line) the screw-measuring compartments of gradually increasing diameter from the inlet ends to the discharge-ends. Fig. 3 represents an end elevation. Fig. 4 shows a transverse section through the casing and one end of the gas-meter drum.

Gas or Vapour Burners.—Boult, A. J.; a communication from J. Sauvan, of Montpellier, France. No. 6608; April 9, 1900.

The patentee claims as his invention "a gas or vapour burner adapted for either lighting purposes by means of incandescence devices or for heating purposes, comprising an annular double-walled burner-tube, through and around which air can pass to be mixed above the tube with the gas issuing from the double-walled tube—the air being guided at the upper part of the burner by means of a cone; a disc above the burner-tube, perforated; and means for adjusting the cone and disc relatively to the burner-tube, for the purpose of regulating the position of these two parts and the air-passage."

APPLICATIONS FOR LETTERS PATENT.

18,802.—Philbrow, W. E., "Internal combustion engines." Oct. 22.
18,881.—Bohne, M., "Gas-motors." Oct. 23.
18,892.—Wright, J. W. B., and Darwin, H., "Fixing gas-fires in open grates." Oct. 23.
18,902.—Hentrich, F., "Gas or petroleum cooking-stoves." Oct. 23.
18,927.—Lake, W. B., and Elliot, E. F., "Self-generating gas or vapour burners." Oct. 23.
18,933.—Harvey, E. C., "Gas heating appliances." Oct. 23.
18,947.—Deike, A. H., Mitchell, J., and Alexander, A. W., "Acetylene generators." Oct. 23.
18,988.—Jackson, J., "Gas cooking and other stoves." Oct. 24.
19,016.—Railsback, L. D., "Acetylene gas-generator." Oct. 24.
19,028.—Jones, P. C., "Improvements in gas-cocks and the method of igniting the gas issuing from the burner." Oct. 24.
19,038.—Morgan, D., "Compression and exhaustion of air or gas." Oct. 24.
19,061.—Sugg, W. T., "Incandescent gas-burners." Oct. 24.
19,104.—Simmance, J. F., and Abady, J., "Gas lamps or lanterns." Oct. 25.
19,154.—Hancock, J. W., "Gas blowpipes." Oct. 26.
19,254.—Pictet, A. P., "Separation of gases from their mixtures." Oct. 27.
19,267.—Scheele, T. A., "Incandescent gas-burners." Oct. 27.
19,275.—Hunt, R., "Gas or oil stoves." Oct. 27.
19,289.—Newton, H., "Fluid-pressure engines." Oct. 27.

Sir Courtenay Boyle presided last Wednesday over a meeting at the Board of Trade with reference to the regulations desired by the scientific departments of the Government in order to prevent interference with the delicate magnetic observations at Kew and Greenwich by the influence of electric traction.

CORRESPONDENCE.

[*We are not responsible for the opinions expressed by correspondents.*]

Condensation in Relation to Naphthalene Deposits.

Sir,—Will you allow me to draw the attention of readers of the "Journal" to the above question. From observations made, I find that where trouble is experienced by the deposits of naphthalene in mains and services, the deposits mainly occur in the summer time, and not in winter. It appears to me reasonable to assume that the amount of naphthalene per ton of coal carbonized is the same winter and summer; and as the make of gas is generally, say, three times as great in winter, it follows that the amount of naphthalene to be dealt with in summer is only about one-third of what it is in winter. Yet there is practically all the trouble in the summer. What is the reason?

I think it is due to the altered conditions of the works plant in the two seasons. In winter, the foul mains and condensers are, as a rule, large enough to cool the gas to about 55° Fahr.; and after flowing through other parts of the plant, which are exposed in a cold atmosphere, it is passed into the holders at a temperature of probably not more than 60° Fahr. It is then cooled in the holders (which are huge coolers in winter) to a temperature which is probably as low as it is ever likely to be brought to. In the summer time, there is available, and often used, a far greater proportion of foul main and condenser for the gas made (which I think may possibly be an aggravation of the trouble, by reason of keeping the gas, at a comparatively high temperature, in prolonged contact with the tar in the foul mains). The gas probably leaves the condenser at a temperature higher than 60° Fahr., from which point it is likely that the temperature increases up to, and in, the gasholders, owing to the great surface exposed to the action of the heated atmosphere.

I submit that the works plant should be cooled by water in the summer time—especially the gasholders—so that the gas is not permitted to leave the works at a temperature exceeding the temperature of the street mains; and I believe that, if the gas were gradually cooled in the works, no trouble would be experienced in the mains and services. Cooling apparatus of this description could be arranged to be absolutely under control to suit the varied atmospheric conditions, at not very great outlay. The only cost would be a little decrease of the illuminating power of the gas, which would be effected on the works instead of in the street mains; but this would be trifling as compared with the cost of clearing stoppages in services.

Nov. 2, 1900. Engineer.

Ability—Luck—or Influence?

Sir,—I have been a reader of the "Journal" for twenty years, and have always looked upon its columns with awe and respect; and whenever my ambition has been fired to pen a few lines for insertion, I have usually quenched the rising wish by thinking that it was not for juveniles like myself to aspire to such notoriety.

But in two recent issues of the "Journal" I have read with particular and growing interest the "Editorial Notes" on Mr. Carnegie's speech at Halifax, on the Educational scheme of the Chamber of Commerce, in which he speaks of "the adaptability of young men to fill leading positions requiring intellect and ability." The letters, too, under the heading of "The British Gas Engineering Profession," which appeared in the "Journal" for Oct. 23, on "the difficulty of true talent and perseverance meeting with its just reward" have touched me in a somewhat sore place. I have, therefore, made up my mind (with your kind permission) to throw off my nervousness, and boldly write you a few lines for insertion on this question of securing a berth in the gas profession after having what is usually regarded as an up-to-date knowledge of the duties.

I was destined for the gas profession "right through," as the Americans would say; and my uncle, a gas and water works engineer and manager, had, I know, very fond hopes that I would blossom into a real modern gas and water works manager, and he spared no pains in putting me up to all he knew of gas and water works construction. When I left school, I was at once placed in my uncle's works, as an ordinary apprentice, to learn mainlaying, gas-fitting, and plumbing. Following this, for a period of fourteen years, I rose from one department to another, until I had charge of the books, stores, was foreman and clerk of works for alterations, new plant, &c.—in fact, had a hand in everything that had to be done at the works. My uncle died when I was 23. The position was duly advertised; and a gentleman was selected, coming from a large works, and under him, for the next five years, I gained additional training, as he was an engineer of good modern experience. I also went in for studying Mr. Newbigging's latest "Handbook," Butterfield on "Gas Manufacture," and several others on chemistry, &c.

Eventually, my chief accepted a better position; and, acting on his advice and with his support, I applied for the post as manager. But the decision come to by the directors was that I did not possess sufficient experience to secure the appointment. Well, I must admit to being keenly disappointed. I had a lot of detail improvements in my mind, which I thought of carrying out, to reduce the cost of working; and I also had a scheme for securing every large customer for cooking and cottagers for lighting purposes. However, my brilliant aspirations were not to be realized.

We talked it all out at home (for by this time I was married); and we came to the conclusion that possibly there might be some truth in the directors' remarks, and that I did not possess sufficient training for the job. The question was "How was I to get this extra training?" for there was such a lack of facility for obtaining it. I was at a 16-million feet works, at a small watering place of 7000 inhabitants, and we were removed some 60 miles from any large centre of manufacture or commerce. I mentally made a list of the departments that I had had no opportunity of being initiated in, up to that time; and they were: Gas-engines, elevators and conveyors, the manufacture of gas plant, and I did not know exactly what gas managers were doing to combat the electric light, which at the time was thought to interfere very much with the consumption of gas, wherever it was introduced. So I deliberately set myself to attain this standard of proficiency. I secured an appointment with a large firm of gas-stove manufacturers, who were also agents over an extensive area

for a leading firm of gas-engine makers. After twelve months, I knew pretty well how to secure customers for cookers, fires, and gas-engines. I then went to a firm of electric lighting and gas engineers; and I had an insight into electrical work, and the fitting up of gas installations on a bigger scale than what I had formerly been accustomed to. My next two places were among hydraulic engineering, electric lighting, and ironfoundry work—chiefly pumps, pipes, sulphate plant, and elevators and conveyors.

Now during the last five years, I have kept a watchful eye on the advertisements for gas or gas and water works managers; and if they were works of from 13 to 20 millions, I have generally sent in an application. The usual reply is that someone else has been selected; but often, no word is sent at all. However, on two occasions I was lucky enough to be on the short list, but failed to secure the appointment owing to my not being in a gas-works at the time of applying. My assurance that I had gained a knowledge that could not by any chance be acquired in staying at a small gas-works, was of no avail whatever. I have lately concluded that I had better get back again into a gas-works, as stove department manager or book-keeper and manager's assistant, and sacrifice 10s. or 15s. per week in salary for a time, and work my way up from this point. But up to the present, I have failed to secure a berth in these departments.

I have never for one moment felt anything but goodwill towards the successful candidates; but I have often thought how perverse it is to miss, and such funny men to secure, the preference. At one place I tried for, a man was selected who got turned out of his previous appointment for drunkenness. He had the berth a month, got turned out again for drunkenness; and—would you believe it?—he secured another place as gas manager shortly after. Another position of gas and water manager was given to a gentleman who was previously in charge of a set of steam-pumps at a water-works. At another, the gas-fitter on the works was appointed manager.

My efforts for minor positions are destined to meet with failure. I tried for the berth as book-keeper to a gas and water company, and a gentleman secured this place who had assisted to edit a treatise on book-keeping; and my latest exploit was as secretary, book-keeper, and manager's assistant at a small works. A gentleman (I am told) out of a grocer's or greengrocer's shop in a neighbouring town secured this place; and the company are paying the retiring book-keeper twelve months' salary to teach this new secretary what he has to do.

My object in detailing my experience is to show that what "Provincial Gas Engineer" says is perfectly correct—that there should be, after attaining a standard of proficiency, some certificate that would guarantee the fitness of a candidate when applying for a berth in the gas profession. For at present, influence and luck have more to do with securing a berth in the gas profession than years of patient work and study.

Oct. 30, 1900. ARGUMENTUM AD JUDICIUM.

The Alcohol Lighting in Paris.

SIR,—In reference to the article in to-day's issue of the "JOURNAL," entitled "The Prospects of Alcohol Lighting," I am informed, by a gentleman who has had something to do with the municipal lighting in Paris, that the so-called "alcohol" lights now being used at the Pont d'Iéna are obtained by a mixture of 5 per cent. of alcohol and 95 per cent. of gasoline. I give you this statement as it was given to me.

London, Oct. 30, 1900. A SCEPTIC.

Retford Gas-Works Profits.—The Retford Corporation Gas Committee report a net profit for the past year of £1081; making the total standing to the credit of profit and loss account £4356. The Committee recommend the erection of a new gasholder at a cost of £5000 or £6000. It will, they anticipate, effect a considerable saving.

Precautions against Accidents with Gas-Stoves.—We learn from the "Chemical Trade Journal" that, in view of the numerous accidents caused by the defective construction and fixing of gas cooking and heating stoves, the Hamburg Police Authorities have issued the following precautions to be observed by persons who instal these appliances: "All gas heating apparatus for baths, cooking, or other fixed gas installations for industrial uses, should be connected with a good exit-flue. The communicating-pipe should have a diameter at least three times that of the service-pipe. When the ventilation of the place in question is sufficiently assured, there can be connected ventilating flues from small gas cookers and heaters, such as teapot stands, chafing-dishes, sad-iron heaters, and other portable apparatus."

Gas Profits and the Rates at Walsall.—At the last meeting of the Walsall Town Council, the Finance Committee submitted the estimates for the district and borough rates for the half year ending March 25, 1901, and recommended that the former should be 1s. 10d. and the latter 6d. in the pound on agricultural land and 1s. on all other hereditaments; making 2s. 10d. in the pound for all hereditaments except land. The financial details of the estimates showed that while for the second half of the past year £1750 was reckoned as profit from the gas undertaking, nothing was put down for the portion of the year 1900-1901. Alderman Baker, in moving the adoption of the estimates, said that, although there was an increase in one rate, there was a corresponding diminution in the o her; so that the two would amount to the same sum as for the past half year. There was 1d. off the district rate, and 1d. on the borough rate. Public lighting was about £340 more, in consequence of the higher price of gas. Dealing with the latter rate, he explained that nothing was estimated to come from the gas-works in the current six months, owing to the "unfortunate prices;" and that therefore the £1750 they had in the corresponding half of the last financial year would have to be provided for out of the increased rate. The estimates were passed. Commenting on this matter, the "Walsall Advertiser" declares Alderman Baker's apology for the absence of gas profits to be only "half the truth." The writer says: "An extra 3d. has been put upon the gas because of the increased cost of coal. This has been done in connection with other gas-works, which are still able to yield handsome profits. The real fact is that the Corporation are having to spend extra money to bring the antiquated gas-works up to date, and put them in a satisfactory state to get a proper yield of gas per ton of coal carbonized."

MISCELLANEOUS NEWS.

GAS COMPANIES' PROTECTION ASSOCIATION.

The Third Annual General Meeting of the Association was held last Tuesday, at the Westminster Palace Hotel, Victoria Street, S.W. Mr. GEORGE LIVESEY, the Chairman, presided; and there were fourteen other members present—viz., Messrs. T. Berridge (Leamington), C. E. Botley (Hastings), G. Clarry (Cardiff), R. Hall (Matlock), H. Hart (Canterbury), H. E. Jones (London), William King (Liverpool), Chas. M. Ohren (Lower Sydenham), R. O. Paterson (Cheltenham), W. R. Phillips (Hitchin), Sydney Y. Shoubridge (Lower Sydenham), C. C. Smith (Southampton), A. G. Snelgrove (West Ham), and Hanbury Thomas (Sheffield).

The SECRETARY (Mr. F. E. Cooper), having read the notice convening the meeting, referred to the letters of apology he had received. The minutes of the second annual meeting, held on Oct. 26, 1899, were also read by him and confirmed. He then mentioned that he had invited nominations for members to serve on the Committee in place of the gentlemen retiring by rotation; but none having been made, those retiring offered themselves for re-election.

THE YEAR'S WORK—ADVANTAGES OF MEMBERSHIP TO SMALL CONCERNS.

The annual accounts and report were next read by the SECRETARY. In the former, it was shown that £324 16s. 10d. was brought forward from the preceding year; and the subscriptions received totalled to £367 10s.—making together £692 6s. 10d. Deducting the expenditure, the balance at bankers and in hand amounted to £465 15s. 6d. The report read—

During the past year, the Association has zealously watched the general interests of Gas Companies.

The following is a list of the Bills which have been introduced into Parliament during the past year, affecting the interests of Gas Companies: Boilers Registration and Inspection Bill, Boilers Registration and Inspection (No. 2) Bill, Engines and Boilers (Persons in Charge) Bill, Petroleum Bill, and Borough Funds Bill. All these Bills were blocked on behalf of the Association; and they all failed to pass into law.

As regards the Borough Funds Bill, the opposition on behalf of the Association on second reading was unsuccessful, as the second reading was passed by a catch vote. Steps were then taken, in conjunction with the Liberty and Property Defence League, to secure numerous necessary amendments being made in the Bill as amended in Committee on its consideration; and the result of such opposition was that the Bill did not proceed further.

The Sub-Committee appointed to consider the question of Municipal Trading requested the Chairman to give evidence before the Joint Committee of the House of Lords and House of Commons, which met to consider this question. This Mr. Livesey did; and the Committee have not yet made their report, but have recommended that they should be re-appointed to continue their inquiries next session.

A large number of companies during the past year have applied to the Secretary for information and assistance on many points connected with the working of gas companies. Amongst the questions upon which the Secretary has been able to assist the members may be mentioned: Assessment of works for income-tax purposes; dispute with surveyor of taxes on question of income; claim of Somerset House authorities for payment of stamp duty on increase of nominal capital by reason of duplication of stock; damage done to gas-mains by electrolysis; question of coal contracts; disputes between gas companies and local authorities consequent upon the companies raising the price of gas, as regards price charged for public lamps and to private consumers; alleged nuisance arising from the use of water gas; fraudulent abstraction of gas; proposals of local authorities to purchase compulsorily gas undertakings; and supply of electricity by local authorities.

It is satisfactory to note that the Association continues in a prosperous condition; and the following ten Companies have joined the Association during the past year: City of Chichester Gas Company, Cullingworth Gas Company, Drighlington and Gildersome Gaslight Company, Horsham Gas Company, Devonport Gas and Coke Company, Cambridge University and Town Gaslight Company, Chigwell, Loughton, and Woodford Gas Company, Newcastle-upon-Tyne and Gateshead Gas Company, Newport (Isle of Wight) Gas Company, St. Annes-on-the-Sea Gaslight and Coke Company. One small Company has resigned its membership.

In regard to the first question upon which he had rendered assistance—the assessment of works for income-tax purposes—the Secretary said that was a case where the Company wanted to know whether or not the rental value of the Manager's house should be included for income-tax purposes. In the next, a Company had incurred very considerable expenditure—nearly £2000—in defending an action brought against them. The Surveyor of Taxes claimed that these costs came under the heading of capital expenditure, and declined to allow their deduction from the amount upon which income-tax was calculated. He (Mr. Cooper) did not think the Surveyor of Taxes could sustain his point, but did not know what had been done since. Regarding the third item, that was an old question. The Somerset House authorities claimed that gas companies should pay double stamp duty on the increased capital in cases where it had been converted, although it was merely a nominal increase. The question was awaiting the settlement of the Midland Railway case, which was going to the House of Lords.

The CHAIRMAN: So far it has been decided against the Midland Company; and I understand, if they are unsuccessful, it will make a difference to them of nearly £60,000.

The SECRETARY (proceeding) said the item as to the damage to gas-mains by electrolysis explained itself. The question of coal contracts was one where the coal contractors wanted to impose something very binding; and he was asked to communicate with other companies to see whether similar conditions were inflicted on them. Disputes between gas companies and local authorities as to the price of gas referred to the power to raise the price and as to whether or not the increase could be retrospective. In the Brierley Hill case, the Council declined to pay the increased price; and the town was put in darkness. The item as to alleged nuisance arising from the use of water gas referred to Dublin; and a question upon the subject was asked in Parliament by Mr. Healy.

The point was as to the deleteriousness of the gas. As to the propose d compulsory purchase of a gas-works by a local authority, this referred to one of the smaller companies, who asked for guidance as to the proper course to take under the circumstances. In another instance, information was desired as to whether a gas company could do anything to stop the supply of electricity.

The Chairman said it became his duty to move the acceptance and adoption of the accounts and the report. Dealing first with the accounts, the satisfactory part about them was that the income exceeded the expenditure by an appreciable amount; and the Committee had resolved to invest in Consols £300 of the £462 balance at the bankers. Whether they should alter the subscription or not was a moot point; and the Committee had referred to a Sub-Committee the consideration of the question whether another class of subscribers might not be admitted—that was to say, the very small companies at a lower rate of subscription. But this would be reported upon by the Sub-Committee at a later date. It was satisfactory to find that they had increased their membership during the year. And the strength of an Association of this sort no doubt lay in having a large number of members—not in a few companies paying relatively high subscriptions, but a large number paying moderate subscriptions; and thus have a ramification of the Association all through the country, so as to get as many companies as possible interested in it, because help might be given in various ways, even by small companies. Proceeding to the report, he said he knew the Secretary had watched very closely all the Bills mentioned therein, and had taken a great deal of trouble in getting members of Parliament to block those which were obnoxious. It was satisfactory that none of them had passed. As to the question of municipal trading, this was gone into by the Committee; and he (the Chairman) was requested to appear before the Lords and Commons Committee who were deputed to consider the subject. This he did; but as to what would be the effect of the inquiry, they did not at present know. One of the main uses of the Association was the dissemination of information. Many companies—large ones as well as the small ones—found knotty points come before them, and then they wanted someone to whom they could apply for assistance. If there were no such Association, what would they do? but having such an Association, the most natural and proper thing was to apply to the Secretary. He thought he might say that the number of such applications during the past year proved its usefulness; and the result, he hoped, had been satisfactory to the applicants. Of course, the list of questions in the report was merely a sample; the Secretary had had a great many more communications than were there represented. As to the question of the assessment of works for income-tax purposes, he believed one point that had arisen had been whether anything should be allowed for depreciation. The authorities would not allow it for the general plant; but they had allowed it for gasholders, because they could not depreciate a gasholder year by year. It lasted until it was worn out; and then it was gone. He understood from Mr. Crowther Smith that the course they had adopted in his case was to allow a certain percentage from the value of the holders to be deducted every year. He (the Chairman) some years ago, went to Somerset House in connection with the same point. They were then unwilling to allow a percentage; but they said they would allow the Company to deduct the value of the holder when it was worn out. And so, when a holder had become worn out, they had deducted the value of it at £15 per 1000 cubic feet capacity. Most of the holders had been small ones; but the authorities had always allowed the deduction at this rate. All the other questions the Secretary had explained; but, as the report said, it was satisfactory to know the Association continued in a prosperous condition in one sense. But in a double sense it was very prosperous. It was prosperous financially; and prosperous in even a better way, in that it had proved its usefulness. All they wanted to do was to convince gas companies generally that this was a useful Association—that it could render them essential service. And this being so, the natural result should be that they should all become members.

Mr. H. E. Jones seconded the motion; remarking that, if gas companies realized the return they got for their subscriptions—the consultation and deliberation twice a year and more frequently of men such as were then in the room, he was sure they would feel the money was well laid out.

Mr. R. Hall (Matlock) spoke of the special advantages which such an Association offered to the smaller gas companies, in the matter of assistance and advice, for no other expense than the amount of the subscription. Only a few weeks ago, he had a dispute with the Clerk of the District Council. He (Mr. Hall) took one view and the Clerk took another. Ultimately, the Council, being members of the Urban District Councils Association, referred the question to the Agents of that body; and they replied at great length—taking, happily, his (Mr. Hall's) view The Clerk and the Council accepted the advice of the Agents, and saved further dispute. The District Councils Association was therefore of great service to the Council; and the Company were well satisfied. The assistance rendered by the Agents of that Association could be rendered as efficiently and usefully by Mr. Cooper. If the smaller companies realized this, he was sure they would become members at once.

The motion was unanimously carried.

Re-appointment of Members of Committee.

The Chairman said the next business was the re-election of the retiring members of Committee. They were: Messrs. Thornton Andrews (Swansea), C. E. Botley (Hastings), H. B. Chamberlain (British Gaslight Company), G. Clarry (Cardiff), J. W. Helps (Croydon), and R. O. Paterson (Cheltenham). He mentioned that the members were largely indebted to Mr. Thornton Andrews for the formation of the Association; and as to the other names, they could not have a better selection.

Mr. T. Berridge proposed, and Mr. Chas. M. Ohren seconded, the re-election of the retiring members; and the proposition was unanimously carried.

Issue of Stock and Shares Locally—A Point in Gas-Works Purchase.

Mr. Hall said there were one or two points he should like to bring before the meeting. He happened to be a representative of a very small Company; and he thought the Committee were all representatives of large companies. [No.] At any rate, those who were connected with the management of small companies took a very deep interest in all that was passing, and especially in the doings of the two Metropolitan Gas Companies. So far as the South Metropolitan Company and its Chairman were concerned, they took the greatest interest and pleasure in their proceedings. It was a fact, and a material fact, that what was done in connection with the two London Gas Companies gave a turn to affairs relating to gas companies generally, just as the London County Council was a kind of example to local authorities all over the country. The London Companies fought on a large scale the battles which some of the other companies had to fight every now and then on a small scale. There was one point on which he felt very strongly—that was, the desirability of keeping new capital in their own district. Mr. Livesey had managed to do this in the case of the South Metropolitan Company. A local complaint was that the profits were made in the place, and then distributed among shareholders all over the country. The local authorities conveniently forgot, when they acquired the undertakings themselves, that they went far enough away to get their capital. But that was the local complaint in many cases—that a great number of the shareholders to whom the profits went resided a distance away. But it was no use sending out invitations to tender for stock or shares. They found that very few people tendered; and in one case he knew of a wealthy lady who stepped in and cleared the whole lot. But they were anxious to distribute the shares among the ratepayers and the consumers. If they could go to them and say, "We offer you the shares at a certain price," they would have them applied for over and over again. It would be better for the company, better for the consumers, and more satisfactory to the neighbourhood. There was another matter upon which he wished to speak, and which was always in their minds—that was, the question of purchase. To show his point, he mentioned an instance where the price of gas was put up in consequence of the increase in the price of coal; but the company he referred to did not want to do so, had it not happened that they were afraid of letting down the profits for the local authority to step in and take the advantage. It worked out against the public that they should always be compelled to keep up their profits lest advantage should be taken of their letting them down. This was really, if they looked at it from a just point of view, a great hardship for a company who were doing their duty in every respect, and taking no advantage of the sliding-scale—keeping the dividend down to the ordinary 10 per cent., and giving any advantage beyond that to the consumer. It was a great hardship that they should always be feeling themselves at the mercy of some clap-trap fellow, and never feel free from attack. That was the sort of thing they had to put up with in the country. There was all the difference in the world between an offer from an authority to treat with a company, and going to them and saying "we mean to have you."

The Chairman said, as a rule, the local authorities waited until a company went to Parliament; and then it was for the company to see that their case was put properly before the Parliamentary Committee. He was afraid all they could do was to wait for the report of the Lords and Commons Committee on Municipal Trading. The Association would watch the matter; and whenever there was an opportunity of putting in a word against purchase, they would do so.

On the motion of Mr. Snelgrove, seconded by Mr. Crowther Smith, a unanimous vote of thanks was passed to the Chairman for the courteous way in which he had presided over the meeting.

The Chairman expressed his appreciation; and, referring to Mr. Hall's remarks, said he might say a few words about the issue of stock to consumers. He had done his part to induce gas companies to take this course, and had found fault with some of them coming to London to sell stock. Take Brighton, for instance, they sold in London. But his friend Mr. H. E. Jones was Consulting Engineer for the Eastbourne Gas Company; and they sold at Eastbourne. The Croydon Gas Company sold their stock in their own town. When the South Metropolitan Company were in Parliament some three or four years ago, they asked permission to offer stock directly to the consumers; but they could not get it. They were told it would be an alteration of the Standing Order about the Auction Clauses; and there was a difficulty in fixing the price. What ordinary investors wanted to know was at what price they could buy the stock. They did not understand tendering at a reserve price, and that they should tender at something above it. There were two Companies who did this: The Act required that they should advertise the stock for sale by tender in papers circulating in the district. These Companies selected papers that were not read by financial people. They complied with the letter of the Act absolutely. They got no tenders, and then, having advertised it, they were free to offer it elsewhere, at the reserve price. Both Companies had it in their Acts that, if the stock was not sold by tender or auction, then it might be offered to "shareholders, consumers, or employees." They consequently offered it to the consumers. At the present time the two Companies were issuing stock in this way—the Crystal Palace Company were offering £20,000, and the South Metropolitan Company £100,000. Neither of the Companies previously got a single tender, though they strictly complied with the Act.

Mr. Ohren (in answer to the Chairman) said that upwards of £18,000 had been applied for up to the present; and there was yet another fortnight for applications to be sent in.

The Chairman stated that out of the £100,000 in the case of the South Metropolitan Company £90,000 had been applied for up to that day. He was told that companies who were trying to sell stock by auction or tender could not get tenders.

Mr. William King stated his experience in selling in Liverpool (say) £50,000 or £70,000 of stock at a time. They advertised in the local papers, and had the sale in a public sale-room. The stock was put up in £100 or smaller lots; and the people came in—brokers, consumers, or anyone else—and bid just as they pleased. Each lot was put up separately. They had not the slightest difficulty in selling the stock; and they could put more up at any time.

The Chairman said that was just what they did not want to do—to sell stock to the ordinary investors. They wanted to sell to the customers. But they found the consumers did not buy when stock was offered at the Auction Mart—the Stock Exchange people being the ones who bought it. They issued a circular to every consumer with the quarterly accounts or independently, offering the stock in £5 or multiples of £5, at the reserve price, on the ground that the consumer who invested his £5, £10, or £50 would fight for the Company, while the man who invested his £5000 did not care for them a snap. Thus they secured a number of local friends,

and got better prices than if they sold by auction or tender in the ordinary way.

THE PRICE OF COAL—A HEALTHY SIGN.

The CHAIRMAN further remarked that he had received an interesting piece of information. The Crystal Palace Gas Company required a small additional quantity of coal for the winter. But they would not give the price asked by the coalowners; and in about three weeks it had gradually come down by 3s.—from 22s. 6d. delivered, to 19s. 7d.

This concluded the proceedings.

CITY CORPORATION CONFERENCE ON THE PRICE OF GAS IN LONDON.

The Conference of Local Authorities convened by the Corporation of London to consider the question of the charges for gas in the Metropolis was held last Wednesday at the Guildhall. Of the 44 Authorities invited to send delegates, 37 were represented. The proceedings were opened with due ceremony by the Right Hon. the Lord Mayor.

His LORDSHIP, on taking the chair, informed those assembled that the Corporation, with that regard for the public interest which distinguished them, had agreed, by resolution, that a Conference of the Local Authorities should be held to consider the increasing charges of the Gas Companies in the Metropolis. He extended to the delegates a hearty welcome, and trusted that arrangements would be made which would be for the public benefit. He invited them to elect a Chairman to succeed him.

Mr. A. C. MORTON, who, as our readers are aware, has taken a great interest in the question, was unanimously appointed to the chair.

Following this, Mr. H. M. BATES, the Principal Clerk of the Corporation Health Department, was selected to perform the duties of Clerk to the conference.

The CHAIRMAN, in his opening address, said this was a conference of all the Local Authorities of London. He believed all had appointed three delegates, excepting perhaps two. So far as he knew at the moment, 117 delegates had been appointed to meet; but, of course, all who were selected might not be present. They were assembled on an equal footing; the Corporation having only three delegates the same as the other Authorities. The conference had been convened largely on account of the great interest the Corporation had for many years taken in the wants and requirements of the gas consumers of the whole of London. They had felt for some time that the considerable difference existing in the price of gas on the north of the Thames as compared with the south side, was a matter that required the serious attention of the people of London. They had invited delegates from the Local Authorities in the south as well as on the north, in order that they might assist them. For many years, it had been felt a great burden, and a distinct grievance, that consumers who by accident or necessity lived on the north side of the Thames should be compelled to pay a higher price for gas than those who resided on the south side. Why gas should cost on the north 3s. 5d. per 1000 cubic feet, and only 2s. 8d. on the south was a mystery which called for a solution. But whether it was solved that day or not, it was clear that the Gaslight and Coke Company must reduce their charges, failing which, steps would have to be taken in Parliament to provide a remedy. This question of excessive charge against the Gaslight Company was not in any sense a new one. As far back as 1868, the difference between them and the South Metropolitan Company was 9d. per 1000 cubic feet—viz., 4s. against 3s. 3d.; while to-day it was still 9d., 3s. 5d, and 2s. 8d. respectively, or, if they allowed the Gaslight Company the ¾d. per 1000 feet they claimed by giving free meters to consumers, the figure would be 8¼d. per 1000 cubic feet. The South Metropolitan Company was not a charitable institution. They were told this Company paid their men better, and gave their shareholders a good dividend; and, consequently, it did not want any great strength of mind to see that gas should be made as cheaply on the north as in the south. Since 1868, the great difference had gone on—sometimes the figure was a little more, sometimes a trifle less than 9d. per 1000 feet—until Parliament appointed last year a Select Committee of Inquiry into the charges of the Metropolitan Companies. The Corporation (who, between the years 1860 and 1880, had spent upwards of £29,000 in opposing or promoting Bills in the interest of the gas consumers) gave evidence before that Committee. The results of the labours of the Committee were embodied in a report, and were well known to all. The figure of 9d. per 1000 cubic feet which the Gaslight and Coke Company demanded above the South Metropolitan Company did not convey much information until they looked at the enormous annual output of the former—viz., nearly 22,000 million cubic feet, about 19,500 million feet of which was sold to private customers on the north side of the Thames, which, at the present difference of 9d., represented between £700,000 and £800,000 per annum, of which sum the Corporation paid annually about £3000 for markets, police stations, &c. This large sum of money was the extra annual burden upon the gas consumers north of the Thames. This, of course, was the great point before them—that over three-quarters of a million of money was taken out of the pockets of the consumers on the north. The burden fell hardly on the small manufacturers and printers, who were compelled to use gas-engines because they had no room for steam power. They paid large sums for gas, making a difference on manufactured articles of about 40 per cent. between the north and south. In the district served by the three large Gas Companies, there were, at the beginning of 1897, about 4600 gas-engines of all sizes, from ½-man power to 100-horse power. At that time, there were in the South Metropolitan district alone, 150 ½-horse power, 100 1-horse power, and 120 2-horse power engines at work. Since then the number in the Metropolis had grown to above 7000, of which about 3500 to 4000 were in the district of the Gaslight and Coke Company, and about 1500 were in the City. The best customers in the City of London of the gas-engine manufacturers were the printing, publishing, book-binding, and allied trades, situated in the neighbourhood of Fleet Street and Whitefriars. These firms used the major portion of the 1500 gas-engines in the City. In 1867, on the consideration of the Metropolis Gas Bill, a statement was given in to the Parliamentary Committee presided over by Lord Cardwell from the Gas Companies' Committee to the effect that, if they were allowed to amalgamate, it would result in a reduction of working expenses, and thus ultimately benefit the consumers. The exact contrary had come to pass. There were thirteen Companies at that date; there were but three now. How, he asked, had the Gaslight and Coke Company justified this great privilege of amalgamating with the Gas Companies north of the Thames? It was not found that the benefits of amalgamation, and the consequent reduction of expenditure that should have followed, had been of any use whatever to the consumer, though this great monopolist Company had everything in their favour to warrant them in supplying gas at least as cheaply as on the south. He had a statement which showed they had the largest area, that they supplied more gas per mile of main than the other Companies, that they had the richest class of consumers, the biggest income, and the largest profit—

Area, &c., of the Gaslight and Coke Company.

The largest and most compact district in the world	67 square miles
Most densely populated	About 2½ millions
Largest number of consumers	353,740
Rateable value of area	£25,666,000
Greatest consumption per mile of main	10,595,000 cub. ft.
Customers per mile of main	173
Largest number of public lights	1,083,212
Public lamps per mile of main	24
The richest private customers (*i.e.*, average consumption per annum)—	
Gaslight and Coke Company	58,160 cubic feet
South Metropolitan Company	49,571 " "
Gas sold (1899)	21,656,746 thousands
Income from all sources	£4,129,272
Net profit	£1,117,233

Mr. Morton then dealt at some length with the Bills of the two Companies that were before Parliament last session, commenting on the proposal in the South Metropolitan Bill to take over the southern portion of the district of the Gaslight Company, and the possible effect, if the transfer had been carried through, on the price charged for public purposes north of the Thames. Had, he remarked, the southern district been sold, the lowest charge to private consumers in any part of the Gaslight Company's district would have been the price charged on the north side; and the cost of public lamps would have automatically risen to that level. The aggregate quantity of gas consumed by public authorities for public lamps in the north was about 1000 million cubic feet. Upon this quantity, every penny of difference in price amounted to more than £4000. At 9d., the present difference was about £36,000 in favour of the public lighting, or about 16s. per annum for every public lamp consuming 5 feet per hour. In the City alone, the difference was about £1746 per annum. As there was no provision in the South Metropolitan Bill for keeping this arrangement alive, the Corporation, in conjunction with the London County Council and the Local Authorities, strenuously opposed the Bill both in the House of Lords and the Commons; and the House of Lords Committee unanimously rejected the preamble so far as it related to this matter. Had the opposition not succeeded, the Bill would have practically given to the Gaslight Company a present of nearly £1,000,000—that being the capitalized value of the amount the Local Authorities would have lost on the public lighting. In addition to this, a further sum of £900,000 would have been received by the Company from the South Metropolitan Company as the agreed price to be paid by the latter for the southern area. Thus Parliament would have put an enormous amount of capital at the disposal of the Gaslight Company, without any conditions attached, such as were drawn up by the Select Committee of Inquiry; and this after Parliament had twice refused to grant the Company a single penny of additional capital. They were not assembled that day to run down public joint-stock companies; but they had a right to say that, when Parliament granted a giant monopoly like this, there should be some restriction—some regulation—whereby the gas consumers (who were at the mercy of this big Company) should be protected against unfair prices. It had been suggested that the conference should have been postponed until after the new municipal bodies had been elected; but he gave reasons why it should not. He next referred to communications received on the subject. In one, a Mr. Phillips, of 27, Nicholas Lane, wrote that one of the reasons given by the Gas Companies for their extra charges was that they had to pay rates and taxes; and these rates and taxes added 2¼d. per 1000 cubic feet to the price of gas. He (Mr. Morton) believed there had been a general complaint that the Companies were not rated high enough. They got the use of the streets for nothing; and therefore it was not much to ask them to pay something towards the general rates, the same as other people. Another letter was from the St. Luke's (Peabody Buildings) Protection League, and was signed by 400 persons.*

Mr. HUDSON (Chairman of the Corporation Streets Committee) moved the first resolution—

That, in the opinion of this conference, Parliament should intervene to protect gas consumers from the evil effects of the giant monopoly brought about by the Gas Acts of 1847 and 1860, and that the London Local Authorities should combine for the purpose of getting such relief from Parliament as may be deemed equitable.

In his remarks, he spoke of the value of combination among the Local Authorities, and said it was right they should combine together to this one particular end—to prevent any increase in the price of gas.

Mr. EDGAR SYDNEY (Greenwich) seconded the motion.

Mr. H. C. RICHARDS, Q.C., M.P., remarked that the letter last referred to by the Chairman was from a number of his constituents. The people living in Peabody Buildings, some 800 in number, felt very acutely the difference in the price of gas, as consumed through the penny-in-the-slot meters. In his profession, he could make excuses for most people—(laughter)—but not for the Gas Companies. He could not see why the mere crossing of the river should lead to this wonderful difference in price. The working people felt the increase so strongly that many of

* The communication signed by the 400 tenants of Peabody Buildings, St. Luke's, was as follows: "Pledge of 400 Consumers in St. Luke's—I the undersigned do support a request to the Gaslight and Coke Company for a reduction in the price of gas consumed by me; and, in the event of a refusal by the Gaslight and Coke Company, I do pledge myself not to use the penny-in-the-slot in my rooms until the price of gas is reduced." Then followed the signatures.

them were gradually buying oil-lamps, which were most dangerous things. He suggested that the new Councils should push forward the provision of electric lighting—particularly for the humbler dwellings. If the Gas Companies were going to fight the City with the new Municipalities behind it, he was perfectly certain they would come a cropper. He hoped the London Members of Parliament would do all they could in supporting the House of Lords in resisting these great monopolies, for the Lords appeared to do more in this way than the Commons.

Mr. TRENNER (Holborn) urged that the resolution should go further than it did. Parliament had intervened already; and they wanted Parliament to do something more than intervene. They ought not to have to wait until the Companies went to Parliament before something definite was done. Alluding to the inquiry by the Powers of Charge Committee, he asserted that no satisfactory reason was given for the high price of gas on behalf of the Gaslight and Coke Company. One reason Mr. Field, the General Manager, then gave for the high price was that they had so much obsolete capital, which ranked for dividend, and consequently represented a difference in the price of gas of 1d or 2d. per 1000 cubic feet. It did not seem to occur to Mr. Field that they ought to wipe off this obsolete capital by a sinking fund. Another reason he gave was the competition of the electric light. But the higher they raised the price of gas, the more the competition would go on; and if this sort of thing continued, it appeared to him it would lead to the price of gas going up to perhaps 10s. per 1000 cubic feet. If the Company lowered the price of gas, and so sold more, and utilized their capital to a greater extent, that would be one way of bringing about further reductions. In Holborn, they so much resented the increase that they had swept gas from the Town Hall, and put in the electric light.

Mr. WENBORN (Shoreditch) did not think there would be much difference of opinion on this particular resolution. Somewhat to his regret, the Board he represented had taken a determined stand against any and all proposals for amalgamation. He should like to hear speakers refer incidentally to this point.

Mr. DOBSON (St. George's-the-Martyr) agreed that the Companies should be opposed; but it was to the Houses of Lords and Commons they must look to bring these monopolies under control.

Mr. F. W. VERNEY (London County Council) spoke of the oppression of these monopolies on the poorer people of the Metropolis. He represented Peckham; and there, it was true, they were not so hardly dealt with as the consumers north of the river. But still they in the south felt this was a matter that should be taken up and dealt with by practical business men. He proceeded to quote the conclusions of Lord Cardwell's Committee in 1867—emphasizing the one where they said: "Your Committee have now to repeat the expression of their decided opinion that, either by way of regulation or independent supply, the consumer is entitled to far more efficient control than he at present enjoys with respect to the supply of gas in the Metropolis." Here they had a Committee actually recommending independent competition; and, in this report, the Local Authorities had strong confirmation of the action they were taking.

Mr. GOODWIN (St. Saviour's) thought that what they wanted to know was the cost to the Company of making gas per 1000 cubic feet. The *crux* of the whole thing, it seemed to him, was that the Company in the north did not know how to make gas so well as the Company in the south; and if the Board of Trade or some body was brought into existence to check the cost of manufacture, they would know exactly where the fault laid.

Mr. J. GLASS (Stoke Newington) opposed; his first reason being that he felt his Board should have had an opportunity of discussing the resolutions before being finally set for presentation at the conference. He was as eager to get cheap gas as anybody. But he believed no greater boon had been conferred upon the City or any other place than the supply of gas by those who had devoted their time and capital in that direction. Perhaps it was time that the regulation of the Companies was reviewed; but he was not one of those who felt that, because the Companies had carried on business for many years, and because they were successful, the Local Authorities should now seize hold of the undertakings, and turn them to the benefit of the public generally. This cry about cheap gas was not a new one; and there might be a good deal to say on the other side. The cry about high charges was heard in 1875; and the sliding scale of price and dividend was the consequence. It was eagerly accepted by the City, the Metropolitan Board of Works, and by Lord Salisbury; and it had hitherto been carried out very properly by the Companies. The time had perhaps arrived when it might be revised; but there was no mention of this in the resolution, which went back to the Gas Acts of 1847 and 1860—ignoring altogether the compact made between the consumers and the Companies in 1875. Referring to the comparisons between the cost of gas north and south of the Thames, he alluded to the fact that the Gaslight Company were compelled, in consequence of pressure, to go several miles out of London to manufacture a large portion of their gas, and to lay immense mains to bring it to London. These mains cost an enormous sum. This was unproductive capital, but dividends had to be paid upon it. The South Metropolitan Company had nothing to pay in this way.

The resolution was then put and carried unanimously.

The second resolution submitted was as follows:—

That, in the opinion of this conference, the Gaslight and Coke Company are not justified in charging more per 1000 feet for gas supplied on the north side of the Thames than is charged by themselves and the South Metropolitan Gas Company for gas supplied on the south side, and that the Gas Companies of the Metropolis working under the sliding-scale should not be allowed to charge more per 1000 feet for gas supplied than the lowest price at which it is supplied by any one of them, so that gas consumers should not be compelled, as under the present monopoly, to make good the loss incurred by bad management.

Mr. SUTHERLAND (Marylebone), speaking in support, referred to the change in the local government of London; observing that, in setting things in train for a reduction in the price of gas, the Vestries would go out of office with the feeling that they had done all they could for the consumers. If they succeeded in bringing the price of gas down in the north to what it was in the south, they would have accomplished a useful work. The electric light and the poorer class of consumer also received the attention of the speaker; and he concluded by urging that what they should aim at was the revision of the sliding-scale.

Mr. Cox SINCLAIR (St. Pancras) stated that, in his district, they did not feel the increased price of gas so much as in some others, because they had an excellent electric lighting installation, and were no doubt great competitors of the Gas Company. He believed they were now virtually supplying electricity to the consumers cheaper than gas. They had not yet installed the light into the poorer neighbourhoods; and it would take some years to get it all over the parish. They were, however, pushing on the works as fast as possible.

Mr. B. L. COHEN, M.P. (London County Council) thought the resolution most equitable and moderate. They were doing, and would continue to do, a powerful and beneficent work by bringing to bear, by these resolutions, a certain amount of pressure on the local bodies, which, if exercised temperately and unitedly, would not fail to impress Parliament. As a member of the House of Commons in the last Parliament, he moved for, and perhaps was instrumental in obtaining, the Select Committee of 1898. He thought he might say that all the members of the Committee were powerfully impressed by the manner in which the Gaslight and Coke Company emerged from the inquiry. None of them ought to complain of the rise in the price of gas, which was brought about by the deplorable increase in the cost of coal; but the enhanced price which was levied most inequitably by the Gaslight and Coke Company north of the Thames was not brought about mainly by the price of coal, but it was the outcome of mismanagement, due to thoughtlessness on the part of the management; and for this the shareholders must suffer—certainly the consumers ought not to. He considered, in the inquiry by the House of Commons a year and a half ago, there was not a shred of a pretext whereon the Gaslight and Coke Company could make out a claim for charging an enhanced price in comparison with the Company on the south side of the river. If the Gaslight and Coke Company had only pursued, he would almost say, the decorous course of paying some regard to the Select Committee of the House of Commons, they would come before Parliament, at any rate if not with clean hands, with hands not so soiled as those with which they would appear the next time they came before the House. Unless they showed some deference to the recommendations of the Select Committee, they would keep on going before the House of Commons for a new trial, and they would be refused in the manner which their past mismanagement richly deserved.

Colonel BLAIR (Paddington) said he should not be satisfied until he saw the price of gas down to 2s. 6d. per 1000 feet. The consumers had been under a kind of partnership with the Gas Companies; but, if the sliding-scale did not act now, he did not feel inclined to rest content with the judgment of his forefathers. They ought to begin the new century with a new and honest sliding-scale. He thought the most sensible thing to do would be to elect a committee of experts to fix a decent sliding-scale, and force it in Parliament. The aim of the County Council was to buy up and confiscate; and this set many men against them. He personally always thought the Council were not dealing quite fairly with the Gas Companies. As the consumers stood at present, they were co-partners with the Companies. It was all very well to speak of monopolies; but where would the 30 millions of money have been got for these supplies had it not been for monopolies? The Local Authorities could never have carried out the work themselves; and they ought to be thankful to the Companies for what they had done. Look, he remarked, at the money that had been spent in fighting the Companies, which had all come out of the pockets of the ratepayers. "For goodness sake," he said in conclusion, "let a committee of gentlemen be appointed who know what they are doing, and have a decent sliding-scale framed and carried through Parliament."

Mr. Cox (Shoreditch) pointed out that if the competition of the electric light forced up the price of gas, the poorer people would be the greatest sufferers. The only possible way to meet this was by the extension of the electric light system. In Shoreditch they had one of the best electric lighting installations in London; and they supplied electricity more generally than most parishes. They were supplying in streets where the residential population resided; and they had one or two blocks of excellent model dwellings where the light was supplied to the tenants for a small charge per week.

Mr TRENNER stated that he knew a manufacturer on the north side of the river whose gas bill for his engines came to £1000 a year; and if his factory was on the south side of the Thames the same quantity of gas would only cost £750. It was monstrous that a manufacturer on the north should have to pay this excess for no reason excepting the arbitrary action of a Company.

Mr. JOHNSON (Clerkenwell) pointed out that conference after conference had been held on this question of the price of gas; and it was time a drastic resolution was passed, and something really done. The sliding-scale arrangement needed reconsideration, as the conditions had altered since its inception twenty-five years ago.

Mr. VERNEY desired to correct a previous speaker. It was untrue that no capital was raised, or not much, before a monopoly was created. For many years—from 1810 onwards—capital was raised before the Companies had monopolies, which were created by the action of the Companies themselves.

Mr. VEZEY (Rotherhithe) gave some information about the South Metropolitan Bill of last session, which revealed his ignorance on the subject.

Mr. HOWARD (Mile End) complained that in Stepney the Commercial Company sent a notice, on the 6th of April, to the Local Authority to say that the price of gas had been raised from 2s. 6d. to 3s. He thought this was overstepping the mark. Gas Companies ought not to be allowed to raise the price, when they had contracts with public bodies, without giving certainly three months' notice.

The resolution was unanimously carried.

Mr. TRENNER introduced the next resolution—

That the advantages secured to the Local Authorities on the north side of the Thames by the City of London Gas Act of 1868 and the Amalgamation Scheme of 1883, as to the supply of gas for public purposes, should not be interfered with.

In the course of his remarks, Mr. Trenner went over the well-trodden ground in connection with the recommendation of the Select Committee of last year, that the southern portion of the Gaslight Company's area should be transferred to the South Metropolitan Company; the proposals in this direction contained in the Bill of the latter Company last session; and their possible effect on the price of gas for public purposes in the northern part of the Gaslight Company's district. The money expended

by the Local Authorities in defending this part of the Bill was, in his opinion, well spent. The present resolution was designed for the purpose of securing to them the advantages now possessed in the event of the transfer taking place.

Mr. WILKES (Islington), among other remarks in supporting the resolution, stated that when coal was, comparatively speaking, at a low figure, and the Company were charging 2s. 11d. per 1000 cubic feet for gas, their profit was not so large as it was now from residuals. They were making a much larger amount by the residuals at present than they were in the early part of the year; and the cost price of the gas was far less now, although coal had increased in cost so much.

Colonel BLAIR (Paddington) was against robbing the gas consumer to get cheap lighting for the streets. He regarded it as an unsound principle.

Mr. WILSON (St. George's-the-Martyr) stated that his district was supplied partly by the South Metropolitan Gas Company and partly by the Gaslight and Coke Company. They had just entered into a contract with the former for street lighting by No. 4 incandescent burners for £3 6s. each lamp per annum. They were supposed to be supplied with gas at the same price by the Gaslight Company, who wanted to charge £4 2s. 11d., and in addition 8d. for every new mantle, and 1s. for putting it on. Then they had had new columns from the South Metropolitan Company for £2 10s. each and from the Gaslight Company for £7 19s. 6d. These figures showed that a few safeguards were required in connection with other matters than the actual price of gas. Things wanted looking into all round.

The resolution was agreed to.

After a short conversation, a slight addition was made to the next resolution as originally drafted, in order to include the conference convened by the London County Council. The following is the form in which it was finally passed:—

That the Corporation of London and the London County Council be asked to take active steps to protect the London gas consumers in the direction indicated by the resolutions passed at the Conferences convened by the Corporation and the London County Council, and to oppose the granting of further powers by Parliament to the Gas Companies unless such relief be given.

Finally, the Corporation were requested to send copies of the resolutions to the Board of Trade, the Local Government Board, the London County Council, and each of the new London Borough Councils.

The Chairman was heartily thanked for the courteous manner in which he had conducted the proceedings; and shortly afterwards the Lady Mayoress entertained the delegates to tea at the Mansion House.

PRESENTATIONS TO MR. J. FERGUSON BELL.

Last Tuesday evening, Mr. John Ferguson Bell, Assoc.M.Inst.C.E., late Engineer and Manager of the gas and electricity works of the Stafford Corporation, was the recipient of a testimonial from many friends in the town on his leaving to take the management of the Derby Gas-Works. The presentation was made in the Mayor's Parlour, at the Borough Hall—Mr. C. H. Wright, Chairman of the Gas and Electricity Committee presiding, in the unavoidable absence of the Mayor (Mr. W. C. T. Mynors), who, however, telegraphed his good wishes for Mr. Bell's future, and his thanks for his zeal and energy, and his successful management of the works which had been under his charge.

The CHAIRMAN, in making the presentation, expressed regret at the absence of the Mayor, and said that during the time Mr. Bell had been at Stafford—nearly seventeen years—the gas-works had been turned absolutely upside down and inside out. This spoke well for his ability. Mr. Bell had always been to the front in dealing with matters connected with his work. In addition to being an able Gas Engineer, he was thoroughly capable as an Electrical Engineer; and he had saved the town a large amount of money by the efficient way in which he had carried out the electric lighting works when called upon to do so five or six years ago. In addition to carrying out all the works in a successful way from an engineering point of view, he had also acquitted himself well from the commercial standpoint. While the gas-works had been altered, Mr. Bell had made them pay handsomely. The ratepayers had had a contribution from them for many years. During Mr. Bell's management, they had repaid between £30,000 and £40,000 on capital account, and had contributed something like £30,000 to the rates; so that he had been responsible for paying over £60,000 for the good of the town. This was a matter of great satisfaction to them all. The appreciation of his services was shown by the fact that, the moment the testimonial was set on foot, there was a spontaneous response. In handing Mr. Bell the gifts on behalf of the subscribers, he (the Chairman) knew he was expressing their sentiments when he said they all hoped that in the future he would have a happy and prosperous career. He joined with the Mayor in thanking Mr. Bell for the zeal and energy he had displayed, and for his successful management of the Gas and Electricity Departments. These were the sentiments of all present, and of nearly every inhabitant of Stafford; and he hoped Mr. Bell would accept them as being expressed with all sincerity.

The testimonial consisted of an illuminated address and a silver tea and coffee service and salver. Upon the salver was the following inscription: "Presented, with a silver tea and coffee service, to Mr. John Ferguson Bell, C.E., late Engineer and Manager of the Stafford Corporation Gas and Electricity Works, by numerous friends and well-wishers. October, 1900." The text of the illuminated address was as follows:—

To John Ferguson Bell, Esq., C.E., Late Engineer and Manager of the Stafford Corporation Gas and Electricity Works.

We, the undersigned, as representatives of a large number of your friends, desire to place on record our high appreciation of the conscientious manner in which for a period of seventeen years you have discharged the important duties attached to your late appointment, and of the ability and zeal with which such duties have been performed, to the great benefit of the inhabitants of the borough and its environs.

Under your personal supervision, the gas-works have been entirely reconstructed and enlarged, and the electricity works established and developed. Exacting as have been your duties, you have evidenced a real interest in the furtherance of every object affecting the welfare of the town.

While we regret the termination of your official connection with the borough, we heartily congratulate you on your appointment to the post of Engineer and Manager of the Derby Gas-Works, where you will find wider scope for the exercise of your talents.

In wishing you every success for the future, we beg, on behalf of the subscribers, your acceptance of the accompanying silver tea and coffee service as a lasting proof of our esteem and regard.

The address bore the signatures of the Mayor, the Town Clerk (Mr. M. F. Blakiston), the Chairman of the Gas and Electricity Committee (Mr. C. H. Wright), the late Chairman and Vice Chairman of the Committee, and the members of the Presentation Committee.

Mr. BELL, on rising to acknowledge the gifts, was very warmly received. He said everybody had a red-letter day in his life, and that was pre-eminently his. He thanked all from the bottom of his heart, but especially the Chairman for the kind and flattering remarks he had made. Having referred to his relations with his various Chairmen, the Town Clerk, and the other signatories of the address, he went on to say that when he took charge of the gas-works the output was 80 million cubic feet. At the present time it was more than double that quantity; and the price had been reduced from 3s. 6d. with meter-rents to 2s. 6d. without them. While he was Engineer, the sum of £30,000 was handed over to the rates; and a similar amount had been employed in reduction of capital. The works had been remodelled and extended, the railway siding had been made to connect them with the two railway systems, and the electric light works had been in operation for five years without, he believed, a single failure. About two years ago an expert was called in to make a valuation of the gas-works; and his figures showed that the works were worth double the amount at which they stood in the books. It was not so much for their intrinsic value that he should treasure the gifts, but because they represented to him good and kindly feelings—the feelings of those who had known him for a period of sixteen years or more, and among whom he had moved from day to day. The address would remind him of the pleasant days he had spent in the service of the town, and of the gentlemen with whom he had been closely associated; and to all of them he offered his heartfelt thanks. In Mr. Pooley, his successor, they had a capable and competent Engineer for both departments; and he believed that the longer he remained with them, the more he would be appreciated. He thanked them also on behalf of his good wife. They would always look back to Stafford with pleasant memories.

Votes of thanks were then accorded to the Chairman and to Mr. W. Ward (the Hon. Secretary to the Testimonial Committee); and these having been briefly acknowledged, the proceedings closed.

The following morning, the employees at the gas and electric light works presented Mr. Bell with a very handsome silver tray in a morocco case, with the following inscription upon it: "Presented to J. F. Bell, Esq., C.E., by the staff and workmen of the Stafford Corporation Gas and Electric Department, on his leaving for Derby, 31st July." Mr. Hubert Pooley, the new Manager, was present. Mr. A. Poulson made the presentation, and spoke in high terms of Mr. Bell, who briefly responded; saying that one of the best things the Gas Committee had done was to introduce the profit-sharing system. He added that the way to increase dividends was to work as hard as they could. He was sure Mr. Pooley would do his duty well, and that they would get on satisfactorily together.

NEW GAS-WORKS SCHEME FOR COVENTRY.

At the Meeting of the Coventry City Council last Tuesday, the Gas Committee reported on the steps taken to obtain land at Foleshill for additional gas-works. They had caused plans to be prepared by the Gas Engineer (Mr. George Winstanley) for laying out the site. The plans showed sections for buildings and plant, with a producing capacity of 2½ million cubic feet per day; and the estimates were: Lands and preparation £11,250, trunk main from works to Coventry £14,000, manufacturing plant £98,270, and contingencies £6480—total £130,000. The Committee recommended that the Council authorize them to proceed with the erection of the buildings and plant, in accordance with the plans and estimates, and that the Estates and Finance Committee be empowered to raise the necessary funds by loan as required. Mr. Griffiths, Chairman of the Committee, in moving the adoption of the recommendations, said the necessity for the new works was absolute. The wonder was there had not been a very serious breakdown under the present arrangements. The new works would permit of 2½ million cubic feet of gas per day being made; but at present provision would only be made for 1¼ millions. It would be two years before the new plant would be in working order. The manufacture of gas at the new site would be less expensive than at the present works. A letter was read from Mr. George Livesey, their Consulting Engineer, in favour of the scheme. Mr. R. S. Rotherham seconded the proposal, and said a great deal more gas was being turned out of the present works than they were really capable of producing. If the works had been removed to Foleshill as suggested some years ago, a very considerable sum of money might have been saved, especially in regard to the cost of materials and labour. Alderman Hill generally approved of the points raised in favour of the scheme; and Mr. Lee thought the Gas Committee's case had been proved. Alderman Gulson hoped the new works would produce considerable profits in aid of the rates; while Dr. Callaghan questioned whether the present was a proper time to go in for this expense. Alderman Andrews thought the Gas Committee rather too sanguine about the prospects of the Foleshill works, especially taking into consideration the spread of electric lighting. Other members supported the proposals; and eventually the recommendations were adopted without dissent.

An extraordinary general meeting of the Welsbach Incandescent Gas-Light Company, Limited, was held last Friday, at which the resolution altering the Articles of Association, and conferring upon the Directors borrowing powers to the extent of £250,000, was submitted for confirmation. The matter was so fully dealt with at the two preceding meetings (as reported in the "JOURNAL") that Sir Henry Burdett merely formally moved the confirmation of the resolution; and it was at once agreed to.

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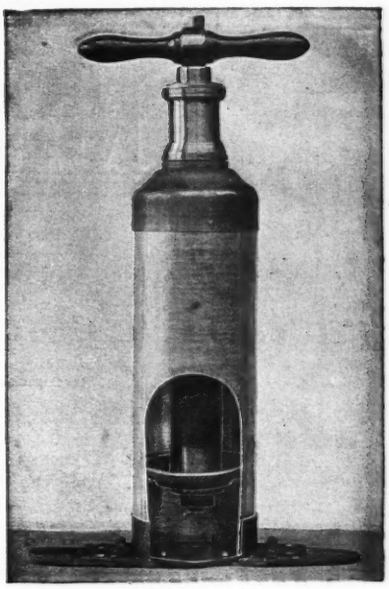

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COLONIAL GAS ASSOCIATION, LIMITED.

The Annual General Meeting of the Association was held last Tuesday, at the London Offices, Suffolk House, Laurence Pountney Hill, E.C.—Mr. SAMUEL SPENCER in the chair.

The SECRETARY (Mr. A. J. Kingdon) having read the notice convening the meeting, the report and accounts were taken as read.

The CHAIRMAN, in moving their adoption, said he had much pleasure in saying the Association had again improved their position; and the Directors were enabled to recommend an increased dividend, as foreshadowed at the annual meeting last year. Further than this, they were fully justified in saying that they would be able to do so again when they met the shareholders next year, as the prospects of Australia were improving, and the trade of the country was steadily increasing. It was highly gratifying to find that the Colony was gradually getting back to a prosperous condition. It was pleasing to him to be in a position to point out that the reserve fund was now £1496, or some £800 in excess of the amount at which it stood last year. After adding so much to this fund, and paying an increased dividend for the year, it was with much pleasure that they carried a little more forward—viz., £471—as undivided profits than last year. They therefore started the current year in a very satisfactory position. The increase of the business this year had equalled 8 per cent.; and they had 97 new consumers. The stocks, it would be noticed, were considerably more than last year; the chief item being coal. Their Managing-Director (Mr. G. Swinburne) considered it a wise thing to have a larger stock, as coal in Australia, though not advancing in anything like the proportion it had in this country, did show signs of some 20 or 25 per cent. increase. Mr. Swinburne therefore took advantage of the opportunity of putting into store a considerable quantity (nearly double the amount he usually held); and they hoped to secure their remaining requirements at a reasonable price. Mr. Swinburne feared it might mean a rise of 2s. per ton. Still he would do his best to obtain cheap supplies; and he was hopeful the increase would not exceed that figure. Since closing the accounts, the Directors had made arrangements to take over the Bairnsdeale Gas Company; and he (the Chairman) was pleased to say it had been carried out, so that the Association now possessed twelve works. The terms of purchase they considered were favourable to both parties; and the result to the Association had been arranged on a 5 per cent. profit basis. The sum agreed upon was £8250; and it was paid by the issue of £6000 in 1200 fully-paid £5 shares, and taking over a mortgage of £2250 at 5 per cent., which could be continued, or paid off, at pleasure. The Directors thought, however, it would be well to continue this, as their invested funds, which were more than enough to meet this sum, returned a larger amount than 5 per cent., and therefore they considered it advisable, in the interests of the Company, not to disturb the investments, as they were in companies that had good prospects of increasing dividends. With the issue made, in acquiring these works, the Association were now in a position to apply for a Stock Exchange quotation; and if it met with the approval of the meeting, they would be pleased to take steps to bring it about at an early date. Personally he should like it to be done, as, though it might not just now improve the value of the shares, he felt confident that they would find a much wider market for the disposal of them when occasion required. Very few of the shares came on to the market; and those that did had always been easily disposed of. Still, by the shares being better known, they might get a larger demand for them; and the price would almost to a certainty increase. It was gratifying to know they had had a transfer through the office this month at £3 2s. 6d.; and as the dividend for this year was 3¾ per cent., with the prospect of an increase during the coming year, the purchase gave at once over 6 per cent., and in the course of next year probably 7 per cent., which was a good return on the investment. Alluding next to the balance-sheet, he said he thought the figures he had to give would be satisfactory evidence of the progress they were making. During the past three years, the dividend had been increased ½ per cent. annually; and it would be noticed that the net revenue this year was £4170, against £3809 last year. The reserve fund was £1496, against £671. The receipts for gas came to £10,839, against £9502; and, with residuals, the total sales amounted to £11,755, against £10,388, which must be considered extremely satisfactory. Coal, wages, &c., totalled to £6239, against £5351. The coal, &c., in stock was valued at £1166, compared with £597; and this the Managing-Director considered a wise increase. In conclusion, the Chairman read an extract from a recent speech by the Hon. Robert Reid, of Melbourne. Speaking of the future of Australian commerce, he said: "After forty years' experience in the trade of Victoria, I think we may confidently assert that it is now in a sound and safer position than it ever has been in in our history. It is pleasant for me to state that it has improved in every sense of the word."

Mr. W. C. PARKINSON, in seconding the motion, said the accounts they received from the other side were most satisfactory, considering that he works were not an easy matter for the Managing-Director to look after If they had twelve works squeezed into one—making one good-sized works of the whole—the management would be a simple matter; but, instead of that, they were spread over twelve different places, and very small some of them were. However, they found there were satisfactory increases going on at nearly all the works; and, from recent information, the Directors believed the movement for federation in the Colonies would considerably benefit the Association at several of their works. Probably new railways would be opened up; and at one of the works, particularly, the Manager expected a considerable increase. The anticipations of twelve months ago had been fully realized; and the Directors felt inclined to prophesy there were still better days to come.

The motion was unanimously carried.

On the proposition of the CHAIRMAN, seconded by Mr. A. G. HAMMACK, a dividend for the half year was declared at the rate of 4½ per cent. per annum, free of income-tax.

The CHAIRMAN next moved, and Mr. PARKINSON seconded, the re-election of Mr. G. H. Haywood as a Director. This was agreed to; and then Mr. Parkinson was re-elected on the motion of Mr. HAYWOOD, seconded by the CHAIRMAN.

Messrs. Lass, Wood, and Drew were re-appointed Auditors, on the motion of Mr. M. CURRY, seconded by Mr. W. CHAFFER.

A little conversation ensued with reference to an application being made for a Stock Exchange quotation. No formal resolution was proposed; but the shareholders expressed their approval of the suggestion—leaving the matter in the hands of the Directors to do as they thought wise, after receiving the necessary documents from Australia, and consulting with brokers.

The CHAIRMAN, in proposing a vote of thanks to Mr. Swinburne, remarked that their Managing-Director had the affairs of the Association closely at heart. To show the esteem in which he was held, it might be mentioned that since the last meeting, Mr. Swinburne had been elected a Director of the Metropolitan Gas Company of Melbourne, and Chairman of the Broken Hill Water Company.

Mr. PARKINSON seconded the motion, which was heartily agreed to.

The CHAIRMAN, replying to questions, said the price of coal in Australia had not been affected very much. The best coal was now only about 10s. per ton; and if they could get 50 per cent. slack, it reduced the price, because the slack was only one-half the price of the other. In answer to Mr. Samuel While, he added that they would have to pay for coal perhaps 2s. per ton more after March, as what they had in stock and still coming in would carry them on till then. In regard to residuals, he thought they came out somewhat better in proportion than they did in England.

On the motion of Mr. R. H. DYER, seconded by Mr. WHILE, the thanks of the shareholders were tendered to the Chairman and Directors; and a reply by the CHAIRMAN concluded the proceedings.

DEVONPORT GAS COMPANY.

The Proposed Application to Parliament.

A Meeting of this Company was held last Tuesday to consider resolutions authorizing the Directors to promote a Bill to extend the powers conferred on the Company by their Act of 1853. Mr. A. BENNEE presided.

The CHAIRMAN said the Directors had not come to the conclusion to go to Parliament without full deliberation—in fact, they had been accused of neglect of their duty to the town and the shareholders for not having taken this step before. However, the Directors believed they knew their business, and the way in which they should supply the wants of the town, quite as well as their critics, some of whom had shown not an atom of knowledge of the Company's real position. It would have been more charitable and honest, as well as more conducive to the welfare of the town, if those who troubled so much about the affairs of the Company had only sought a little real light, instead of publishing false and calumnious statements about them. The Directors had watched the progress of the Company, and had endeavoured to economize at all times. They challenged any amount of inquiry. The time had now come when they felt that they could justly ask the shareholders to permit them to go to Parliament for increased powers. Their business had extended, and was still growing; and they wanted more capital. It was desirable to substitute mechanical for manual stoking. They had ordered machines—anticipating the shareholders' permission—and hoped to have them at work in a few days. Coal and freight had advanced in price cent. per cent., which also meant that more capital was required. As more streets were built, the mains had to be extended; and they knew as well as their critics that the cost of this should be debited to capital. Nothing had been done but what was to the interest of the shareholders and the consumers. They were told they would be opposed by the Town Council, who were promoting a Bill of their own. Well, as soon as the time arrived when the Directors deemed it necessary to promote a Bill, they thought it only just to the town to communicate the fact, through their Solicitor, to the Town Clerk; and as they wished to do the thing as pleasantly and amicably as possible, they added that, if the Town Council had any suggestion to make, they would be prepared to consider it. Naturally, they did not want to waste their own money; nor, as they were large ratepayers, did they desire to see that of the ratepayers wasted. The Town Clerk very properly communicated to the Council what the Directors said; but instructions were given, though not unanimously, for steps to be taken with a view to the promotion of a Bill. If the Council wished to do this, they were as much at liberty to do so as the Company. The Directors did not fear any parliamentary or other inquiry. The Company's position was impregnable; and if the town wished to waste money, so much the worse for the ratepayers. If Parliament gave them the power to buy the gas undertaking, he did not think the Council would have anything for many a long year to hand over to supplement the rates. Local authorities bled gas consumers to conceal their own mismanagement of local affairs; but the consumers at Devonport were not likely to assist the Town Council in buying up the Company's property. The Directors were desirous of meeting the Corporation; but if it was to be a fight, then a fight it must be. It was said that in the public lighting they had been robbing the town of 10s. to 12s. per lamp per annum "Robbing" was a harsh term to make use of, even if they had had the best of the bargain. But had they had the best of it? They provides the lamps, posts, service-pipes, and everything in connection with them, supplied them with gas, and lighted and maintained them, for £3 7s. 6d. each per annum. As to the outlay, he found that the lamp-posts cost the Company £1 15s. each; lamps, 13s. 6d.; governors, 1s. 6d.; service, 10s., opening and repairing the roads, 10s.; frame, 7s.; and frog, 4s.—a total capital outlay of £4 1s. They supplied 20,750 cubic feet of gas per annum; but taking it at 20,000 cubic feet, the cost for gas, at 2s. 6d. per 1000 feet, was £2 10s.; interest on outlay, 4s.; painting, reglazing, &c., 1s.; and lamplighters' wages, 13s.—making a total of £3 8s., as compared with £3 7s. 6d. which they charged the Corporation. Another grievance was that the Company refused to supply gas to the district of St. Budeaux which had been added to the borough. This had been magnified. They had never refused to go to St. Budeaux. When the Corporation, after a vain application to the Plymouth Gas Company, asked them for terms, they supplied them. The Corporation thought they knew the Company's business better than they did themselves, and said they could do the lighting on very different terms. Then the Company wrote asking for the Corporation's views; but, though this was two years ago, they had never received an answer. As to the public lighting, the Directors agreed with the Council that it was the best thing they could do to take it into their own hands. They had an interview with representatives of the Council on this subject, and the Town Clerk asked if the terms which were suggested would include St. Budeaux. His reply was "No;"

but that if the lighting of the added area was to be discussed, they were quite prepared to attend another meeting. That meeting had never been called; but about a month ago Mr. Bellamy, of Liverpool, representing the Corporation, had a long interview with him on the subject of the lighting, with the result that they drew up some heads of agreement, and the Directors proposed to fall in with the view of the Corporation. Though Mr. Bellamy came to talk professedly of the public lighting, it did not require much acumen to see that he had another object in view. He asked whether the Company would sell the undertaking; and told him they could get a splendid price for it—mentioning 27 or even 28 years' purchase. He (Mr. Bennee) reminded Mr. Bellamy that the general terms of agreement were 30 or 31 years' purchase, and that in one case 33 years' purchase had been allowed. He also told him the Company were not going to sell; that they had engaged Counsel and engineering experts, and were quite prepared to fight, but were equally ready, if possible, to avoid fighting. They had made advances, so that it might not be said that there was any difficulty in coming to terms short of selling. He concluded by submitting a formal motion authorizing the Directors to promote a Bill or Bills to alter or amend the Devonport Gas and Coke Act, 1853, and to confer further money and other powers upon the Company.

The Deputy-Chairman (Mr. A. White) seconded the motion.

The Chairman, in reply to questions, explained that the new capital would be raised under the auction clauses, and that the sliding-scale would be adopted. It was proposed to convert the present original shares into £10 shares at 5 per cent., instead of £5 shares at 10 per cent., and the guaranteed shares into permanent £7 10s. shares at 4 per cent., which would give in perpetuity the same rate of interest as they were now getting. As to the manufacture of water gas, the question of the relative cheapness of this and coal gas was one of the price of oil *versus* coal. He thought oil was just now dearer than coal. There were advantages in connection with water gas, and the time might come when the Company would supply it; but they did not anticipate doing so at present.

Mr. Finch suggested that, as the Corporation expressed a determination to buy the undertaking, it was not wise to give the Directors power to throw money away in promoting the Bill.

The Chairman said the Directors had faith in the impartiality and fairness of the Parliamentary Committees, and did not fear the result They knew they had a valuable property, and meant to preserve it. They were ready to meet the Town Council and discuss the question in any phase they pleased; but they were not going to have their property taken away by anybody.

The motion was carried unanimously.

A DISPUTE REGARDING COKE-CONVEYORS AT THE KEIGHLEY GAS-WORKS.

During two days of the past week, Mr. Thomas Newbigging has sat at Keighley as Umpire in an arbitration between Messrs. Newton, Chambers, and Co., Limited, of Sheffield, and the Keighley Corporation. It appears that the firm named have installed some labour-saving machinery at the Corporation gas-works, in the shape of a system of coke-conveyors and elevators. The conveyor does not work to the satisfaction of the Corporation; hence the proceedings. Messrs. Newton, Chambers, and Co. sought to enforce a claim of £2537 18s. 6d., less £2140 payment on account; leaving a balance due of £397 18s. 6d. The Corporation filed a counter-claim for £4212 14s. 4d., in order to have the machinery put into satisfactory working order, or, in the alternative, for £7042 14s. 4d. damages for breach of contract.

The Contractors were represented by Mr. F. P. Rhodes, and the Corporation by Mr. W. J. Waugh.

Opening the case for the plaintiffs on Tuesday, Mr. Rhodes explained that the proceedings arose out of a dispute as to a small railway or tramway erected by his clients at the gas-works whereby the coke was conveyed from the retorts to a large hopper ready for removal off the premises, instead of having all this work done by manual labour. Messrs. Newton, Chambers, and Co. fitted the apparatus; but at first it was found that it would not work, owing to there being running sand and water 15 feet below the floor-line of the retort-house, which found their way into the conveyors. A modified system was put in; and the conveyors were lifted from under the floor and put under the roof. But unfortunately it had been forgotten that the men working at the regenerator furnace would be underneath, or in such a position that they might get the "drips" from the conveyors. The Manager was, under the circumstances, between the devil and the deep sea. He must either quench the hot coke in the conveyors earlier than he did, or he would have grumbling from the men below. Mr. Rhodes went on to say that his clients' position was that the machinery would have worked under fair conditions, but it was absolutely unfair to expect any machinery to work under the conditions that the Corporation asked. They must expect in labour-saving appliances of this kind that there should be a large amount of wear and tear; and when the conditions were so unfavourable as in the present case, it was not surprising that the machinery did not work smoothly.

The Umpire afterwards inspected the apparatus at the works; and he concluded the first day's sitting by hearing one witness for the plaintiffs, Mr. Robert Nesbitt, a foreman.

The following day was occupied in completing the evidence of Mr. Nesbitt, and the taking of the evidence of Mr. William Froggatt, the Assistant-Manager of the plaintiffs. During the cross-examination, Mr. Waugh dropped some incidental observation that the parties had kept good friends through all the stages of the dispute. The Arbitrator then interposed, and asked if they could not go one step further and compromise it, and save him the trouble of deciding. Mr. Waugh answered that that would have been done before all the cost had been incurred if it had been possible. Mr. Rhodes said he should be glad were there any road which would land them at a conclusion. The case then proceeded, and was adjourned to Monday, Nov. 19, in Leeds.

The Directors of the South African Lighting Association, Limited, have declared a dividend of 4 per cent. (8 per cent. per annum), free of income-tax.

MANCHESTER CORPORATION GAS SUPPLY.

The Proposed Purchase of a Colliery - Gas Profits and the Rates.

At the Meeting of the Manchester City Council last Wednesday, the minutes presented by the Gas Committee contained a resolution whereby a Special Sub-Committee, consisting of the Chairman, Deputy-Chairman, Alderman Rushworth, and Messrs. Bowes, Harrop, Jennison, Lambert, Phythian, and Smethurst, was appointed to consider and report as to the desirability of purchasing a coal mine or colliery for the supply of coal to the Corporation for gas-making and other purposes. A further resolution of the Committee was to the effect that in future the meter inspectors should be instructed to leave a card with each ordinary consumer, showing the date of inspection, the state of the index, and the quantity of gas registered by each meter at the time of such inspection. The minutes were passed without discussion. In addition to the ordinary minutes, the Chairman (Alderman Gibson) had on the *agenda* a motion to the effect that the present system of subsidizing the rates out of the profits of the gas undertaking was wrong in principle, unjust in practice, inimical to the best interests of the ratepayers, and ought to be discontinued. As, however, this part of the business was not reached until a late hour in the afternoon, Alderman Gibson asked that discussion on the matter should be adjourned to a future meeting. Although, however, his motion has not yet been discussed by the Council, it has aroused considerable public interest; and, together with other matters connected with the gas supply, it has been put prominently before the ratepayers at the municipal elections just decided. In an anonymous statement which has been posted all over the city, the ratepayers were asked the question as to whether they were content with the policy of the Committee in making enormous profits out of gas, which meant the taxing of gas users more than other citizens for the common requirements of all. After giving details of the liabilities and assets of the Gas Department, and its contributions in aid of rates, it was pointed out that the impounded profits in 38 years—that is to say, the excessive charges made to the gas consumers—have amounted to nearly twice as much as the present capital and other liabilities, and have more than supplied the whole of the present property and assets of the undertaking. How long, it was asked, would gas consumers submit to the injustice of having to provide money to reduce the rates of property-owners and others, many of whom were not even residents, and used little or no Manchester gas. The recent increase in the price of gas was carried in the Council notwithstanding the earnest protest of the Chairman of the Committee, who had given notice of a motion against subsidizing the rates out of the profits of the gas undertaking. It was also stated that a reduction in price to 2s. per 1000 cubic feet would leave a good margin of profit, even with coal at its present temporary high price, and would cause an enormous increase in the consumption of gas for motive power, heating, and cooking; thus encouraging industries, and, by largely reducing the consumption of coal, helping to keep down its price, and effecting great improvement in the atmosphere of the city.

GLASGOW CORPORATION GAS SUPPLY.

Proposed Reduction of Illuminating Power.

At the Meeting of the Glasgow Corporation last Thursday, a Sub-Committee of the Gas Committee reported that they had considered the advisability of applying to Parliament for power to amend section 4 of the Glasgow Corporation Gas Act of 1882, which fixes the minimum standard of the illuminating power of the gas supplied by the Corporation at 20 candles. In a memorandum, prepared by Mr. Foulis, the Gas Engineer and General Manager, it was pointed out that the quantities of cannel coal offered to the Corporation, of such a quality as was necessary for the manufacture of gas of 20-candle power, had, for some years, been gradually decreasing; and that the supplies of this class of coal now procurable were quite insufficient to enable so high an illuminating power to be constantly maintained, and, so far as the coalfields in Scotland were concerned, would ere long become practically unobtainable. The Special Sub-Committee, having fully considered and discussed the subject, were of opinion that the time had come when it was expedient to obtain legislative sanction for fixing the minimum standard of the gas supplied by the Corporation for illuminating purposes at 16 candles, which was the quality supplied for similar purposes in most of the towns in England and on the Continent; and, accordingly, they unanimously resolved to recommend to the Corporation that an application be made to Parliament in the ensuing session for power to effect this object.

Mr. R. M. Mitchell, the Convener of the Committee, in moving that the recommendation be adopted, explained that until recently the Engineer thought the matter might be deferred until next year; but, looking to the state of the coal and oil trades, he now considered it should be pushed forward as rapidly as possible. There was great and increasing difficulty in getting cannel coal in sufficient quantity to ensure that the gas manufactured would be equal to the present standard. The quantity of cannel offered to the Gas Committee this year was about 128,000 tons, as against 357,000 tons in the year 1896. It was not a matter of price. The citizens would be glad to pay a good figure; but the class of coal required was becoming exhausted in Scotland. In 1882, the illuminating power of the gas was reduced to 20 candles; and it was more necessary now to lower the standard. A large quantity of gas was used for cooking, heating, and motive power; and for these purposes a high quality was not necessary. A lower quality would be more profitable to the consumers. Again, incandescent gas lighting was now more extensively used for domestic and public purposes; and in that case also there was no advantage to be gained by using a high-quality gas. As to the illuminating power of gas in other cities, he pointed out that Glasgow was pretty much at the head of towns in Scotland, and that in most places in England and on the Continent the quality of the gas for lighting purposes did not exceed 16 candles. This was the highest illuminating power which any corporation or private company supplied in England; and they found difficulty in keeping up that standard. The power sought would be permissive. It was only intended to be used when the Committee found it was impossible for them

to do better. They did not wish to try to rob the citizens, but to give them the best gas they could at cost price, according to the kind of coal they could buy. But if it was impossible to get the coal needed for a high illuminating power, the Committee should not be bound to maintain the higher standard.

Mr. Bow seconded the motion.

In reply to a question by Bailie W. F. Anderson,

Mr. FOULIS stated that the result of his experience was that 16-candle gas consumed with an incandescent burner gave as good a light as 20-candle gas in the same burner, or, probably, a better one.

The recommendation was confirmed.

The Gas Committee recommended that application be made to Parliament in the ensuing session for permissive power to establish a superannuation fund in connection with the Gas Department, which would be applicable to, and compulsory upon, all the permanent officials (excepting the General Manager and Treasurer) and workmen of the department; to make contributions to the fund from the gas revenues, in aid of the subscriptions thereto by the workmen themselves; and also for authority to take over and appropriate, in connection with the fund, any moneys or funds received from either of the old Gas Companies, which are at present applied by the Gas Department for benevolent or superannuation purposes.

Mr. MITCHELL moved the approval of the minute.

Preceptor GRAY moved, as an amendment, that the minute be not approved. This, he said, was a far-reaching proposal—the first of its kind to be submitted to the Corporation. The police were pensioned; but their case was exceptional, and they got £40,000 from Government to start the fund. In the Tramway Department there was a friendly society to which the Corporation contributed 4d. for every 6d. paid by the men; but this scheme was not compulsory. The proposal now made would form a precedent which went much farther than they had ever yet gone. They were told that in Manchester and other places a similar grant was given. But they had no information from either that city or Birmingham for the guidance of the Council; and he desired some as to the basis on which the Gas Committee had come to this apparently unanimous recommendation. In the Gas Department they were giving somewhat less than £700 for aiding people who were either unable or less able to work. This money was given pleasantly; and no one need say that anyone came forward as an abject beggar.

Mr. J. H. DICKSON asked that the scheme should be withdrawn. They were there, he said, in the interest of the rich as well as the poor, and to look after all classes. In his opinion, they could do all that was wanted without the sanction of Parliament, if they had the consent of the men.

Bailie STEVENSON asked if it was competent to take money out of the gas-rents, for the purpose suggested, without statutory authority.

The CLERK (Mr. Bowers) said the Act of Parliament stated how the revenue of the Gas Trust was to be applied; and they could not do as was proposed without the sanction of Parliament.

Treasurer MURRAY, in supporting the minute, said all that was required was to have a short clause in an Act of Parliament empowering the Corporation to establish a superannuation fund. He reminded the Council that every day the evil attendant on grants to workmen was increasing, and said that whoever devised a scheme by which some superannuation would be started in any department would do really good service to the Corporation.

On a division, the motion was carried by a large majority; only two members voting for the amendment.

BRADFORD AND THE PROPOSED MUNICIPAL COLLIERY.

The Resolution Rescinded.

On the 9th ult., the Bradford Corporation passed a resolution, instructing the Town Clerk to insert in the Bill to be promoted by the Council in the next session of Parliament a clause empowering them to become the owners of, and to work a colliery or collieries, with powers to borrow the necessary moneys required. Last Wednesday, Mr. Williamson proposed that the resolution be rescinded. He urged the importance of taking this course, as, in his opinion, in the not very distant future it might, and would be, very disastrous, and entail on the city a great and serious loss if such powers were put into practical operation. As guardians of the ratepayers' money, the Council must abstain from so risky an enterprise and speculation. Glasgow, Manchester, and Leeds had refused to entertain such proposals, even with coal-mines at their very doors. Every sensible man knew that this was not the time to talk about buying collieries. Coal was now about double its average value, taking the prices of the last thirty years into account; but less than two years ago the gas-works were consuming coal which had been delivered at 8s. a ton. The present price was 15s.; but a reaction had set in. The market had a downward tendency; and he had no doubt that well within two years' time coal could be bought at the old price. The whole city of Bradford, for all purposes, consumed about 1,300,000 tons of coal a year, which was equal to the output of seven large collieries If each pit produced 4000 tons per week, or 200,000 tons per annum, this, on a twenty years' purchase at the rate of 10s. a ton, would mean a cost of £2,000,000 for each pit. Even at half this estimate, altogether £7,000,000 would be required; and where was so enormous a sum to come from? Mr. J. Triffitt seconded the resolution; remarking that with coal at its present price it was a most inopportune period for buying a mine. The time must not be so very far distant when the price would come down, though a continuance of activity in the iron trade would be against such a reduction. At the same time, there were thousands of waggons of coal which the coal-owners were holding, and in time these waggons would all be full, when the masters would become independent of the men. Sometimes the men were almost masters of the situation; and the Corporation would find that they would not be able to rule a mine unless they became colliers themselves. Mr. E. R. Hartley observed that mines had been described as almost unpurchasable; but he had received offers of three collieries. Taking the increase in the price of coal at 5s. per ton, this cost the consumers in Bradford a sum equal, in a year, to doubling the rates of the city. Whenever a monopoly became a danger to the public, it was time for public bodies to tackle it. The resolution was passed by 31 votes to 29.

ELECTRIC LIGHTING NOTES.

Among Local Authorities who last week decided to make application for electric lighting powers were Beverley, Neath, Todmorden, Wellington, and Widnes.

The Shipley District Council have received a communication from the Local Government Board, authorizing the borrowing of £22,000 for electricity supply purposes.

Mr. G. W. Willcocks, of the Local Government Board, has held an inquiry at Leigh into an application by the Town Council to borrow £5000 for electric lighting extensions. No objection was raised.

The Rhyl District Council have arrived at an agreement with the Tramways Company for the supply of electric current; and this will necessitate an application for an additional loan for extending the installation. The Council have already been authorized to borrow £15,000 for the works.

A Local Government Board inquiry was held at Dewsbury last Wednesday by Colonel Marsh, the Corporation having applied for power to borrow £4500 and £3000 to carry out extensions at their electricity works. It was proved that new works were required, and that additional cables and other plant had had to be obtained. There was no opposition.

In consequence, according to the local view, of the "surprisingly" large demand for electric current, it has been decided to recommend the Canterbury Council to apply for sanction to raise a further loan of £13,000 for the purpose of enlarging the electricity works and extending the plant. The amount of the additional outlay will eventually be £21,000, but for the present it is proposed to carry out only a portion of the scheme.

A conference of representatives from the Nantyglo and Blaina, Abertillery, Abercarn, and Risca District Councils was held at the Abercarn District Council Offices on Monday last week, for the purpose of considering the advisability of promoting a joint scheme of public lighting of the Western Valley by means of electricity. After considerable discussion, it was resolved to recommend the various Councils to jointly employ an expert to report on the subject.

The Wolverhampton Town Council last Wednesday adopted a report of the Lighting Committee recommending the borrowing of £58,942 for the purpose of carrying out extensions to the electrical equipment, to meet the demands for electricity for lighting, power, and traction purposes during the next two years. It was stated that it was intended to bring up the total generating capacity of the lighting and traction plant to 2640 kilowatts, of which 750 kilowatts would be spare plant available for emergencies.

For something like ten years, Chelmsford has had the electric light in the streets; and many of the ratepayers no doubt wish it had not. It has been a constant worry; and complaints as to inefficient lighting have been constant. At the meeting of the Council last Wednesday, the same old story was told; and one councillor stated that they did not by any means get value for their money. The Town Clerk (who must be getting weary of writing on the subject) was instructed to again communicate with the Company, but a despondent member thought this would be useless.

The Walton-on-Thames District Council have been discussing the question of electric lighting. Edmundson's Electricity Corporation, Limited, have notified their intention of applying for a Provisional Order; but the Council have decided to withhold their consent, and to consider the advisability of applying for powers themselves. One member of the Council is dissatisfied with the present lighting by gas, and thinks Walton is the worst lighted place round about. He asserts that the Gas Company have had plenty of chances of improving it, but have failed to do so up to the present. This is a very common story at district council meetings; and more often than not, there is another side to it.

The Batley Corporation, having received authority to supply electricity in the borough and to construct tramways, have applied to the Local Government Board for sanction to borrow £25,602 to cover the cost of a generating station and the laying of cables for electric lighting in the centre of the town. Mr. Sandford Fawcett, an Inspector of the Board, conducted a local inquiry last Wednesday; and the Electrical Engineer (Mr. Clirehugh) and the Town Clerk (Mr. J. H. Craik) laid before him the necessary information. The latter stated that Batley had acquired its own gas-works and constructed water works; and it was the feeling of the Corporation that electric lighting and traction ought also to be in their hands. There was no opposition.

Stafford requires £10,000 for the extension of the electric lighting works; and an application by the Corporation for permission to borrow this sum occupied the attention last Wednesday of Mr. H. P. Boulnois, of the Local Government Board. The Town Clerk (Mr. M. F. Blakiston) stated that the works were started in 1895; and the sanction of the Local Government Board for £20,000 was obtained, and had been spent. There was a growing demand for electric light. The works were progressing, as was seen by the fact that in 1896-7 there was a charge on the rates of something like £1000, but since then nothing had been charged. There was, however, an adverse balance of £400 to be provided for next year. Mr. H. Pooley, the new Gas and Electricity Engineer, said the present demand for the light was enormous. Last year the current generated was 33,369 units; this year it had increased to 100,733 units. It was proposed to lay down 4600 yards of new mains, and to put in an additional engine and dynamo. They estimated the cost of laying the mains at £3500, and of the additional plant, engines, dynamo, &c., at £6500. Mr. J. Ferguson Bell also gave the Inspector some explanatory details as to the works.

Reference has already been made in these "Notes" (*ante*, p. 969) to the dispute between the Canterbury Corporation and the Assessment Committee of the Board of Guardians, with regard to the assessment of the electric light undertaking of the former. The matter has lately been before the Recorder of Canterbury (Mr. F. Safford), sitting at the Surveyors' Institution, as Arbitrator; Mr. G. Thorn Drury appearing for the Corporation, and Mr. Craig, with whom was Mr. Pitman, for the Committee. The Guardians' valuer, it may be remembered, put the gross value of the electric lighting works at £1050, and the rateable value at £700; the gross value of the dust destructor at £300, and the rateable value at £250. The Corporation accepted the proportions assigned, but urged that the Guardians' valuer had simply taken the worth of the building, without regard to the actual profits obtained. The valuation amounted to 24 per cent. of the gross receipts of the undertaking, which, it was submitted, was a proportion immensely higher than that usually reached. Mr. Philip Faraday (Messrs. Faraday and Rogers) assessed the

works at £942 gross and £342 rateable. Mr. Herbert Fuller gave the rateable value as £345. Other expert witnesses were called. The Recorder will announce his decision at the next Quarter Sessions.

We learn from local papers which have reached us that the Ryde municipal election this year has been one of the most exciting struggles since the proposed purchase of the gas-works, nearly thirty years ago. It turned upon a very similar question—whether the Council should provide works necessary for the electric lighting of the town, or whether a Company should do so. The contest was decided almost entirely on the merits of the electric light scheme. Having regard to other projects which the Corporation have in the fire, involving a heavy outlay, the question arose as to whether it was wise of them at the present time to burden themselves and the town with the very serious obligations which the new lighting project would impose. This was an issue on which the ratepayers had a right to be heard; and they spoke with no uncertain sound last Thursday. The candidates in favour of mortgaging the rates to the extent of an initial outlay of £30,000 were Messrs. T. F. Ellery, J. Evans, and H. Sweetman in the west ward. On the other hand, Col. E. Howard-Brooke, Lieut.-Col. J. F. C. Hamilton, J.P., and Mr. A. Teague, in the west ward, and Messrs. P. R. Denny, G. E. Mears, and A. Millward, in the east ward, objected to the expenditure of so large a sum on a speculative undertaking. The result of last Thursday's polling was that the opposition candidates were returned in each case by large majorities. The day was an extremely unpleasant one; so that the large number of the ratepayers who took the trouble to record their votes was evidence of the keen interest shown in the contest.

THE LONDON COUNTY COUNCIL AND THE WATER COMPANIES.

Another Purchase Bill to be Promoted.

At the Meeting of the London County Council to day, the Water Committee will present the following report:—

On May 29 last, the Council, on our recommendation, suspended its Standing Orders so far as they would affect proposals for legislation in the session of 1901 dealing with the Metropolitan Water Supply, and authorized us, if we deemed it advisable, notwithstanding the Standing Orders, to recommend application to Parliament on this subject at any time not later than Nov. 13. We have therefore considered the matter, and now propose to bring it again before the Council. We have already in past years reported from time to time fully on the question of the water supply and the acquisition of the Companies' undertakings. We refer more especially to our report considered by the Council on Nov. 7, 1899, to that on the report of the Royal Commission which was before the Council on March 6, 1900, and to the report of the Parliamentary Committee, which was before the Council on May 22, 1900, on the rejection of the London Water (Purchase) Bill, and the withdrawal, on the same day, of the London Water (Welsh Supply) Bill. These reports appear to us to embody all the material facts connected with the recent legislation promoted by the Council on the water question.

The report of the Royal Commission, published in January last, recommended the acquisition of the Companies' undertakings; thus confirming the policy of purchase—as, indeed, it had already been confirmed years ago by more than one Committee of Parliament. The Council's views as to the terms of purchase may be briefly stated as follows: (1) That the arbitrators should be men of eminence and impartiality, not named by the parties in the ordinary way, but appointed by Parliament or by an independent authority nominated by Parliament. (2) That the price to be paid should be the fair and reasonable value of the undertakings, taking into consideration all the circumstances of the case, and having regard both to the rights and obligations of the Companies. (3) That no additional *solatium* should be given for compulsory purchase, but that the Council should pay "such further sum as the arbitrator may award to meet the cost of re-investing such money (in the event of no arrangement being made by the Council under which such money may be re-invested without cost)." These views were generally approved by the Committee of the House of Commons presided over by Mr. David Plunket, and a careful reading of paragraph 52 of the report of the Commission; which lays down the principles which should guide the arbitrators, will show that there is no irreconcilable conflict in principle between their views and those of the Council. As regards the third point, to which we have always attached special importance, the Commissioners say that in the present case it would be improper for an arbitrator to give any compensation in the nature of a *solatium* for the deprivation of water shares, although he might justly award something to meet the cost of re-investment, and consequent delay, the amount of which would probably be comparatively small. Under these circumstances, we do not anticipate that any serious difficulty will arise as to the precise terms of the arbitration clause which will be submitted to the Council in the Bill.

We need not in this report deal with the views of the Royal Commission as regards the future additional supply, as we cannot recommend the Council to introduce a Bill this session. But there is one recommendation of the Royal Commission to which we must refer, as it is not one which we can recommend the Council to introduce into its Purchase Bill. The Commission proposes the creation of a Water Board on which the Council, as representing London, shall only appoint one third of the whole—viz., ten members out of a total of thirty. Seeing that three-quarters of the population supplied by the Companies reside in London, and that of the rateable value upon which water-rate is charged 84 per cent. is within the county, we cannot believe that members representing London, whatever their views as to the general question of a Trust, can assent to this proposal, which so manifestly ignores the predominant interests and rights of the Metropolitan ratepayers. Without, therefore, discussing the general question, we trust that nearly the whole Council will agree with us that we cannot, in justice to those whom we represent, endorse the recommendations of the Commission in regard to the authority. Of the proposals for legislation during the coming session, one has already been approved by the Council—viz., the Bill which has been rendered necessary by past delays for the prolongation of the period during which what are known as the "sterilization clauses" shall remain effective. The failure of this Bill would be of enormous pecuniary advantage to the Companies; and if there is no Purchase Bill before Parliament, that fact will doubtless be strongly urged as an argument against the Bill. If purchase is further delayed (for which, in view of the report of the Royal Commission, we can see no adequate reason), and if the period of the operation of the "sterilization clauses" is allowed to lapse, as it will very soon, the loss to the London ratepayers will be very great indeed.

We have no information that the Government intend to introduce any Bill dealing with the question, and as the last day on which the matter can be considered by the Council is Nov. 13, we are now obliged to bring up our recommendations. We do not ask the Council at this moment to settle the precise details of the Bill, but to decide the broad question of maintaining the policy of purchase, which has been confirmed by the Royal Commission, and, so far as lies in its power, to press upon the new Parliament the fact, which we do not think can be questioned, that the delay of purchase is annually adding to its costliness. Although we may still be unsuccessful, we feel that no other course is open to us. It will not be the fault of the Council if another year is lost. If a second reading is refused, we are advised that the expense up to that stage will not exceed £200. Should our recommendations be adopted, there will be full opportunity afforded for consideration of the details of the Bill when it is submitted to the Council for approval before deposit. We have requested the Finance Committee to report on the financial bearings of our proposal, and we understand they will do so at the meeting of the Council on Nov. 13. We recommend—(*a*) "That a Bill be promoted in the session of 1901 for the purchase by the Council of the undertakings of the eight Metropolitan Water Companies. (*b*) That it be referred to the Parliamentary Committee to prepare and present to the Council the necessary Bill for carrying out the above recommendation, and also the necessary Water (Finance) Bill."

SCHEME OF WATER SUPPLY FOR DERBYSHIRE.

We learn from local papers that some singular discoveries were made last week in connection with a great water scheme for Derbyshire. The source of the proposed supply is the famous Meerbrook Sough, in Wirksworth and Matlock. A Bill is to be promoted next session for powers to take this water, and to expend a large sum in conveying it from the side of the Derwent to the eastern division of the county of Derby. The spring in question is one of the wonders of the Peak district. It yields from 14 to 18 million gallons per diem at the output near the Matlock highway, and is an overflow from ancient disused lead workings, for which this district was at one time so notable. The water in the hill above has been traced; and there is a natural reservoir of enormous capacity, on which boats are floated similarly to those at Castleton, in North Derbyshire. The supply belongs to the Meerbrook Sough Company, who formerly paid large dividends from lead working; and it has been retained for years with no revenue worthy of the name—the only prospect being a scheme like the one now in hand for water supply. Derby first tested the spring, and then Belper; but it was abandoned, because of the abnormal hardness of the water. Now Ilkeston and Heanor have bought from the Company the option of the source; and a Bill is being prepared. The revelations, which come opportunely before the Bill is presented to Parliament, are, however, such as will, it is expected, necessitate some important amendments to the plans. According to the scheme adopted by the two districts concerned, the Meerbrook is to be pumped from its lower level to a reservoir on the Crich Hill, a height of 700 feet, and conveyed thence in a main to another reservoir at Codnor Park, at an elevation of 500 feet, by gravitation; this being high enough to supply Ilkeston and Heanor. But by carrying out this project it will not be possible to have an auxiliary supply from the forthcoming Derwent Valley water scheme, which is to serve Nottingham, Sheffield, Derby, and Leicester. That scheme will furnish supplies *en route;* but the elevation is at 600 feet—that being sufficient for the towns named. If the height of the reservoir on Crich Hill is reduced to 600 feet, and the mains are enlarged, the extra cost would be about £2000. The Derwent water will not need lime for softening purposes; and there will be no fear of lead contamination. Ilkeston and Heanor have had their water supplies condemned by the Local Government Board; and it is generally thought that something will have to be done without waiting for the Derwent scheme, which cannot be completed under ten years.

"Rates-in-Aid" for Cardiff Corporation Undertakings.—It was stated at the meeting of the Cardiff Finance Committee last Tuesday, that the rate in aid of the water-works for the half year was £4093, equal to nearly a penny rate. This is a considerable improvement on former accounts. Last half the rate in aid of the department was about £6000, and a year ago the sum required was £7704. The rate in aid of the Electrical Department was £564.

Emsworth Gas Company.—The annual meeting of this Company was held on the 25th ult., when the Directors reported that, owing chiefly to an increase in the sale of gas, there had been a substantial profit, notwithstanding the fact that the charge for gas had had to be raised owing to the increased cost of coal. It was recommended that a dividend of 7 per cent., free of income-tax, should be declared. The sum of £948 14s. 8d. had been received for gas during the twelve months ending the 29th of September; and the total receipts were £1180 6s. 1d. There was a sum of £263 15s. 7d. to be carried to the profit and loss account. The report was unanimously adopted. The payment of dividends took £182, and the interest on bonds £43 10s.

Gas Workers' Wages in the South Shields District.—On Saturday, the 27th ult., a deputation representing the workmen, accompanied by Mr. H. Lynas, District Secretary, and Mr. H. Picard, General Organizer of the National Union of Gas Workers and General Labourers, waited upon the Directors of the Federated Gas Companies of Sunderland, South Shields, and Tynemouth, on the subject of wages. After deliberations lasting about five hours, a settlement was arrived at, whereby the stokers will receive 5 per cent. increase on their present rates, and the yard labourers and all other classes included in the application a 4 per cent. increase—the advance to come into force at once. These concessions are to be granted on an agreement being entered into for two years.

NOTES FROM SCOTLAND.

From Our Own Correspondent.

Saturday.

They have a prompt way of doing business in the Corporation of Glasgow. Outside their own circle, it was scarcely known that there was any consideration being given to the question of an immediate reduction in the illuminating power of the gas supplied to the city; but on Thursday the Gas Committee submitted a recommendation to this effect, founded upon a memorandum by the Engineer (Mr. Foulis), and the Corporation adopted it straight off. [See p. 1158.] There is an end of it, so far as the Corporation are concerned. The officials will now take the matter up; and in due time notice will be given of a Bill in Parliament giving authority to do what is proposed. How different it would have been in other places. There are some we know of where the suggestion would have involved an all-round discussion upon a proposal to remit to a Committee to consider; the doings of the Committee would have been followed step by step; and on the presentation of their report, the local universe would have been shaken to its foundations. The Glasgow method is an easy manner in which to get what is wanted. But the arrangement cuts the other way; and it may be truly said that it is risky, because a vote cannot be reviewed till after a certain time, and if the vote had gone against the Gas Committee on this occasion, there could have been no application to Parliament in the next session. In some places there is an extreme of caution in new proposals, which is as far the other way. To take the case of Edinburgh, in this city a Committee cannot initiate new business; they must receive a remit from the Council. That is the first appearance. The presentation and adoption of the report is the next; and after that the business is not final until it has appeared three times in the minutes. That is five appearances instead of one. The meetings are fortnightly; and thus, at the best, a new subject takes ten weeks to "muddle through." This subject of the reduction of the illuminating power is also under consideration in Edinburgh, where Mr. Herring, the Engineer to the Gas Commission, is preparing a report upon it. It is one which it is appropriate to consider at this time. It is almost startling to learn that cannel coal is getting so scarce that only 128,000 tons were offered to the Gas Committee in Glasgow, as compared with 357,000 tons four years ago. With cannel disappearing at this rate, it is an absolute necessity that some provision should be made for the lowering of the illuminating power which is required to be provided. I observe that in Glasgow the power sought is permissive, and will only be used when it is necessary. This is quite proper, because, if cannel can be had, or as long as it can be obtained, there is every reason why it should be used. But, on the other hand, it is also proper that the Gas Committee should have the power, in the event of their not being able to secure the better classes of coal at a reasonable figure, to use coal of lower quality. It is a great power to place in the hands of a Committee; but the coal merchants have unlimited powers, and do not scruple to use them, and where you have limitation on the one side, and no limit on the other, the advantages or disadvantages can easily be premised.

The establishment of a superannuation fund for gas workers is a step in the right direction—this direction being towards the making of the men more contented with their lot, and less disposed to give ear to the blandishments of the wandering stars in the labour world, who, loud-voiced exponents though they may be of the brotherhood of man, always leave behind them recollections of other relations than that of brotherhood as between employers and employed. This superannuation plan cannot be called a profit-sharing scheme, and is, indeed, inferior to it, because of the difficulty of "superannuating" a man who may only work six months in the gas-works, and then leave for other employment. To be just, such a man should get back his contributions to the superannuation fund; but this arrangement would nullify the intended effect of the fund, because, if one man were able to withdraw his contributions to it, so might a thousand. In all such funds there are apparent injustices, in that one man contributes for many years, and dies without deriving benefit; his surviving comrades getting the advantage of his contributions. This is according to the decrees of Providence, however, and cannot be complained of; but it is quite a different case from that of the casual worker. There are hundreds of casual workers in the gas-works of large towns every winter; and it would scarcely be right to make them compulsory contributors to a fund which, from the time they were taken on till they were discharged, it was never intended that they should participate in. This is a point which requires consideration. There is another matter of not less importance, which should be carefully considered. A man is employed for years in a gas-works; every week so much of his pay is retained for superannuation; but he dies before he retires from work, and the Corporation retain his contributions. Those contributions would have gone a certain length in assisting to maintain his wife and family. When he is taken away, should not his widow, or his relatives—at least any dependents he might have—get a sum proportionate to the amount he had contributed? I know that it is a most galling arrangement, in connection with superannuation in the Post Office department, that a man must contribute, and that he may contribute for 49 years, and then die; and his dependents may be obliged to go on to the parish. It would require a higher rate of contribution to add this, which is in reality an insurance branch, to the fund; but it would be a much more satisfying provision for workmen than would be the old-age pension scheme worked alone.

The Corporation of Glasgow are also to ask power in Parliament to reorganize the public lighting arrangements. There are two branches of this service—street lighting and the lighting of common-stairs. The lighting of the streets costs about £30,000 a year, and is wholly charged upon occupiers. The lighting of stairs and closes costs about another £30,000, of which sum £18,000 is charged upon occupiers. It is, however—an awkward arrangement, which is always giving trouble—collected from the occupiers along with the rent, by the owners, who pay it over to the Corporation, retaining 25 per cent. for the trouble of collecting. The balance is defrayed from the general police rate. It is proposed to make all lighting a general charge upon the police rates, and to impose it upon landlords and tenants in equal proportions. This system has been in operation in Edinburgh for some years; and my comment upon it then is what I say now—that it is a simple way of providing for lighting, but

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

Referred to on p. 1135.

Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment	Issue.	Share.	When ex-Dividend.	Dividend or Dividend & Bonus.	NAME.	Closing Prices.	Rise or Fall in Wk.	Yield upon Investment.
£			p. c.	**GAS COMPANIES.**			£ s. d.	£			p. c.	**GAS COMPANIES.**			£ s. d.
590,000	10	Oct 12	10½	Alliance & Dublin 10 p. c.	19—20	..	5 5 0	60,000	5	Sept. 28	7	Ottoman, Ltd. . . .	5—5¼	..	6 7 3
100,000	10	,,	7½	Do. 7 p. c.	18—14	..	5 7 2	500,000	100	June 1	6	People's Gas 2nd Mtg. of Chicago Bonds.	102—106	..	5 13 2
800,000	100	July 2	5	Australian 5 p. c. Deb. .	101—103	..	4 17 1								
200,000	5	May 16	6	Bombay, Ltd. . . .	6—6⅛	..	4 13 4	851,070	10	Oct. 12	7	River Plate Ord. . . .	10⅛—10¾	..	6 10 2
40,000	5	,,	6	Do. New, £4 paid .	4—4⅛	..	5 6 8	250,000	Stk.	June 28	4	Do. 4 p. c. Deb. .	99—101	..	3 19 8
880,000	Stk.	Aug. 15	12	Brentford Consolidated	245—255	..	4 14 1	250,000	10	Sept. 28	8	San Paulo, Ltd. . . .	11—12	..	6 13 4
270,000	,,	,,	9	Do. New . . .	177—182	..	4 18 11	135,000	Stk.	Sept. 14	10	Sheffield A.	234—239	..	4 3 8
50,000	,,	,,	5	Do. 5 p. c. Pref. .	137—142	..	3 10 5	209,700	,,	,,	10	Do. B.	234—239	..	4 3 8
159,375	,,	June 14	4	Do. 4 p. c. Deb. .	116—120	..	3 6 8	447,427	,,	,,	10	Do. C.	232—237	..	4 4 5
220,000	Stk.	Sept. 14	10	Brighton & Hove Orig. .	220—230	..	4 6 11	5,641,885	Stk.	Aug. 15	5¾	South Metrop., 4 p.c. Ord.	128—131	..	4 0 10
226,320	,,	,,	7	Do. A. Ord. Stk. .	150—160	..	4 7 6	1,520,000	,,	July 12	3	Do. 3 p. c. Deb. . .	94—97	..	3 1 10
1,009,500	Stk.	Aug. 29	5	Bristol, 5 p. c. max. .	117—118	..	4 4 9	380,940	Stk.	May 16	5	Southampton Ord. . .	110—115	..	4 6 11
420,000	20	Sept. 28	10	British	39—41	..	4 17 7	70,825	,,	July 12	4	Do. 4 p.c. Deb.	117—122	..	3 5 7
50,000	10	Aug. 15	12	Bromley, Ord. 10 p. c. .	24—26	..	4 12 4	120,000	Stk.	Aug. 30	6	Tottenham A. 5 p.c.	112—117	..	5 2 7
79,000	10	,,	9	Do. 7 p. c. . . .	19—21	..	4 5 8	250,520	,,	,,	4½	and B. 3½ p.c.	80—85	..	5 5 11
500,000	10	Oct. 12	6	Buenos Ayres (New) Ltd.	8¼—8¾	..	6 17 2	61,550	,,	June 14	4	Edmonton 4 p. c. Deb.	111—115	..	3 9 7
220,000	Stk.	June 14	4	Do. 4 p. c. Deb. .	98—100	..	4 0 0	182,380	10	Jan. 12	5	Tuscan, Ltd.	7—8	..	6 5 0
150,000	20	July 12	8¼	Cagliari, Ltd. . . .	23—25	..	6 12 0	149,900	10	July 2	5	Do. 5 p. c. Deb. Red.	98—102	..	4 18 0
100,000	10	Sept. 28	8	Cape Town & Dis., Ltd.	13½—14½	..	5 10 4								
50,000	50	Nov. 2	6	Do. 6 p.c. 1st Mort.	53—55*	..	5 9 1								
550,000	Stk.	Oct 12	12⅜	Commercial Old Stock .	265—275	..	4 12 8								
236,425	,,	,,	9⅜	Do. New do. .	200—210	..	4 12 10								
288,237	,,	June 14	4½	Do. 4½ p. c. Deb. .	133—138	..	3 5 5								
800,000	Stk.	May 31	9	Continental Union, Ltd.	175—180	..	5 0 0								
200,000	,,	,,	7	Do. 7 p. c. Pref. .	170—175	..	4 0 0								
51,600	Stk.	—	14	Croydon A 10 p. c. . .	—	..	—								
178,400	,,	—	11	Do. B 7 p. c. . .	—	..	—								
555,000	Stk.	Aug. 15	6½	Crystal Palace Ord. 5 p.c.	117—122	+2	4 6 1								
60,000	,,	,,	5	Do. 5 p. c. Pref. .	130—135	..	3 14 1	1,720,560	Stk.	Oct. 12	7	East London, Ord. . .	195—200	+1	3 10 0
486,090	10	July 27	11	European, Ltd. . . .	19—20	..	5 10 0	654,740	,,	June 14	4½	Do. 4½ p. c. Deb. .	147—152	..	2 19 3
354,060	10	,,	11	Do. £7 10s. paid .	14—15	..	5 10 0	797,687	,,	,,	3	Do. 3 p. c. Deb. .	98—100	+1	3 0 0
14,993,075	Stk.	Aug. 15	4 1/6	Gas-light and Coke 4 p. c. Ord. . .	98—100	..	4 8 0	700,000	50	June 14	7½	Grand Junction 10 p. c. max. .	108—112	+1½	3 7 0
2,600,000	,,	,,	8½	3½ p. c. max. .	92—94	..	3 14 6	810,000	Stk.	Sept. 28	4	4 p. c. Deb. .	130—135	..	2 19 3
3,799,735	,,	,,	4	4 p. c. Con. Pref.	114—117	..	3 8 5	708,000	Stk.	Aug. 30	14	Kent	300—305	..	4 11 10
3,993,975	,,	June 14	3	3 p. c. Con. Deb.	94—96	..	3 2 6	160,000	,,	,,	7	Do. New, 7 p. c. max. .	200—210	..	3 6 8
70,000	10	Oct. 26	8	Hongkong & China, Ltd.	13—14*	..	5 14 4	1,043,800	100	June 28	10½	Lambeth, 10 p. c. max. .	292—297	..	3 10 8
3,800,000	Stk.	May 16	10	Imperial Continental .	208—213	..	4 13 11	406,200	100	,,	8	Do. 7½ p. c. max. .	205—210	..	3 16 2
473,600	Stk.	Aug. 15	8½	Do. 8½ p. c. Deb. Red,	100—102	+1	3 8 8	350,000	Stk.	Sept. 28	4	Do. 4 p. c. Deb. .	127—130	..	3 1 7
75,000	5	June 14	6	Malta & Medn., Ltd. .	4⅜—5¼	..	5 14 3	500,000	100	Aug. 15	14	New River, New Shares	408—413	−2	3 7 10
560,000	100	Oct. 1	5	Met. of 5 p. c. Deb.	105—108	..	4 12 7	1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb. .	128—133	..	3 0 2
250,000	100	,,	4½	Melbourne 4½ p. c. Deb.	104—106	..	4 4 11	902,300	Stk.	June 14	7½	South-wark Ord. . . .	203—208	+2	3 12 1
541,920	20	May 31	8½	Monte Video, Ltd. . .	10½—11½	..	6 1 8	126,500	100	,,	7½	7½ p. c. max. .	188—193	..	3 17 9
667,946	Stk.	Aug. 30	9½	Newc'tle & Gatesh'd Con.	210—215	..	4 6 1	489,200	Stk.	,,	5	and 5 p. c. Pref.	155—160	..	3 2 6
299,855	Stk.	June 28	8½	Do. 8½ p. c. Deb. .	104—107	..	3 5 5	1,019,585	,,	Oct. 12	4	Vauxhall 4 p. c. A Deb.	128—133	..	3 0 2
150,000	5	May 16	8	Oriental, Ltd. . . .	7—7½	..	5 6 8	1,155,066	Stk.	June 14	10	West Middlesex . . .	278—283	+½	3 10 8
135,000	5	,,	8	Do. New, £4 10s. pd.	5⅞—6⅛	..	5 15 3	200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	140—145	..	3 2 1
15,000	5	,,	8	Do. do. 1879, £1 pd.	1¼—1⅜	..	4 11 5	200,000	,,	Sept. 14	8	Do. 8 p. c. Deb. .	97—99	..	3 0 7
					*Ex. div.								*Ex div.		

WATER COMPANIES.

780,401	Stk.	June 28	11	Chelsea, Ord.	302—307	..	3 11 8								
150,000	,,	,,	5	Do. 5 p. c. Pref. .	155—160	..	3 2 6								
160,000	,,	,,	4½	Do. 4½ p. c. Pref. '75	143—148	..	3 0 10								
175,785	,,	Sept. 28	4½	Do. 4½ p. c. Deb. .	143—148	..	3 0 10								
1,720,560	Stk.	Oct. 12	7	East London, Ord. . .	195—200	+1	3 10 0								
654,740	,,	June 14	4½	Do. 4½ p. c. Deb. .	147—152	..	2 19 3								
797,687	,,	,,	3	Do. 3 p. c. Deb. .	98—100	+1	3 0 0								
700,000	50	June 14	7½	Grand 10 p. c. max. .	108—112	+1½	3 7 0								
810,000	Stk.	Sept. 28	4	Junction 4 p. c. Deb. .	130—135	..	2 19 3								
708,000	Stk.	Aug. 30	14	Kent	300—305	..	4 11 10								
160,000	,,	,,	7	Do. New, 7 p. c. max. .	200—210	..	3 6 8								
1,043,800	100	June 28	10½	Lambeth, 10 p. c. max. .	292—297	..	3 10 8								
406,200	100	,,	8	Do. 7½ p. c. max. .	205—210	..	3 16 2								
350,000	Stk.	Sept. 28	4	Do. 4 p. c. Deb. .	127—130	..	3 1 7								
500,000	100	Aug. 15	14	New River, New Shares	408—413	−2	3 7 10								
1,000,000	Stk.	July 27	4	Do. 4 p. c. Deb. .	128—133	..	3 0 2								
902,300	Stk.	June 14	7½	South-wark Ord. . . .	203—208	+2	3 12 1								
126,500	100	,,	7½	7½ p. c. max. .	188—193	..	3 17 9								
489,200	Stk.	,,	5	and 5 p. c. Pref.	155—160	..	3 2 6								
1,019,585	,,	Oct. 12	4	Vauxhall 4 p. c. A Deb.	128—133	..	3 0 2								
1,155,066	Stk.	June 14	10	West Middlesex . . .	278—283	+½	3 10 8								
200,000	,,	,,	4½	Do. 4½ p. c. Deb. .	140—145	..	3 2 1								
200,000	,,	Sept. 14	8	Do. 8 p. c. Deb. .	97—99	..	3 0 7								
					*Ex div.										

it is open to the objection that it makes the one class pay for the lighting of the premises of another class in the community.

I rejoice at the appointment of Mr. J. Ballantyne, who has been so long Manager of the Rothesay Gas-Works, to succeed Mr. W. Ewing as Manager at Hamilton. I confess that I did not think there was any Town Council at present who could have met and made any appointment, because this is the election week. The nominations were made on Thursday last, and the elections take place on Tuesday next; and it has been matter of common acceptance that the Council went out of office with the nominations—the non-retiring magistrates and the returning officer alone remaining in power. I suppose this must be an erroneous belief. But it may possibly be right; and in that case there might be objection to Mr. Ballantyne's appointment, on technical grounds. At the meeting last night, there was a slight show of opposition; the ground taken being that the vacancy was not advertised. The real reason, however, was that some of the members favoured someone else for the appointment. It is unusual not to advertise a position of so much importance as that of Engineer and Manager at Hamilton. The reasons given for its not being advertised were that the Committee wished the situation to be filled up speedily; and that they knew of a number of men who were perfectly capable of managing the works, and had dealt with them. Of course, there is no duty to advertise; and it is, on all grounds, better that, if the Corporation have made up their minds, they should not advertise, rather than that they should, and put a large number of men to the trouble of applying, and the vexation of being refused, as I have known happen (not, however, in connection with a gas undertaking). The only other name before the Town Council was that of Mr. J. Gibb, who recently went from Lanark to Kirkintilloch. The other two men who were interviewed by the Committee were Mr. J. M'Nair, of Wishaw, and Mr. L. Hislop, of Uddingston. Any one of these would have been quite capable for the post at Hamilton. The choice has fallen upon Mr. Ballantyne, who has had an opportunity of showing what he can do, which the others have not. I refer to the transfer of the gas-works from one site to another, which took place a year or two ago, and which Mr. Ballantyne was able to effect at a moderate cost. The quality of his management is to be gathered from the fact that he has, notwithstanding heavy capital charges, been able to sell gas at 3s. 4d. per 1000 cubic feet. When he is removed from an insular position to the heart of the coal-fields, he will find the production of gas a much easier matter. Mr. Ballantyne was one of the first in Scotland to perceive that a large revenue could be derived from the sale of gas for cooking and heating. In 1893, he read a paper on the subject before the North British Association of Gas Managers at Dundee, which attracted wide attention. He was also among the first to adopt sulphate of ammonia manufacture.

The slander case from Forfar, in which one member of the Town Council and Gas Corporation sued another, and in which the animosity which was said to have led to the utterance of the words complained of arose over the conduct of the gas undertaking, though the words themselves had reference to dealings in hay and straw, came to an end in the Court of Session last week. In March last, a Jury awarded the pursuer (Mr. Christie) one farthing damages. The defender (Mr. R. F. Craik, for a long time Convener of the Gas Committee) sought a new trial, on the ground that the verdict was contrary to the evidence. The Court refused this motion; and they also refused the pursuer his expenses, so that each side will have to bear its own costs. There is not much satisfaction to either party in this.

The ground required for No. 1 Railway in connection with the new Provan Gas-Works at Glasgow—over 6 acres—belongs to the Glasgow Iron and Steel Company, Limited. The Company ask £6386 for the ground, and an annual feu-duty of £154 10s. The Corporation have agreed to offer £3000; and failing acceptance of this, the matter will go to arbitration.

Mr. W. Foulis is to be paid a fee of 200 guineas for his services as Consulting Engineer in connection with the new gas-works at Perth.

The talk of the municipal candidate is more voluminous this week than ever; and, as before, it is in Dundee that the greatest noise about gas supply is being made. Early in the week, Mr. J. R. Christie, who is Convener of the Corporation Gas Committee in Broughty Ferry, and an elector, I presume, in Dundee, spoke at a meeting in support of Mr. Smith's candidature. In the course of his remarks, he contradicted the statements, some of which I have given, that the benzol method of enrichment was an experiment, and that in Broughty Ferry they purchased a two-years' supply of coal. They did not adopt the benzol enricher, he said, without due inquiry; nor without first trying it and being satisfied with it. As to the two-years' supply of coal, they found, when they made up their estimates for the current year, that they had three-tenths of their year's supply of coal left over, and they bought seven-tenths. It had been said that they were paying 19s. 9d. per ton for coal in Broughty Ferry, as against 18s. 11d. in Dundee. If this were the case, why was the price of gas dearer in Dundee than it was in Broughty Ferry? But it was not the case, as the price of their coal and oil together was only 15s. 6d. per ton. On the other side of the account, they would find that Broughty Ferry got back £2 for every £4 worth of coal used; whereas Dundee only received £2 for every £9 worth of coal used. If Dundee secured as much as they did, it would mean a sum of £22,400 a year. The Dundee Commissioners seemed to be wedded to, and could not get a divorce from, cannel as an enricher. In Broughty Ferry they used the same materials six years ago as in Dundee; but they tried the Peebles oil process, and now they had it and the benzol plant, both of which were already far more than paid for out of profits. It was since these had been adopted that Broughty Ferry had scored its very signal success in the gas-making world. Mr. Christie also combated the theory that it was the heavy sum paid for the Dundee gas undertakings which was the cause of the high price of gas there. The capital charges in Dundee, he said, were slightly over 10d. per 1000 cubic feet sold; in Broughty Ferry, 9·37d. Then Mr. Longair, a prominent member of the Gas Commission, made a speech, on Wednesday, in which he said that his sympathies went out to the Gas Manager, who was at times unfairly blamed. He was afraid the Manager had succeeded to a very undesirable and unenviable heritage. Nobody could be held responsible for not foreseeing the great extension and prosperity of the city of Dundee. The docks were useful in their day; but two of them at least were now almost obsolete. The same thing applied to the gas-works.

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Notwithstanding the arbitration, he held that the gas-works had been taken over at a very high price; and when the £39,000 of legal expenses was added, the figure paid was undoubtedly excessive. With regard to the new works, which they might expect to see in full swing about a year hence, a valuation by two of the most competent experts in Great Britain must be insisted upon. The true value of the works must be ascertained. He believed that they would be found to be hopelessly bankrupt. That was to say, when they had put on the one side their financial obligations, these would not be far short of £500,000; while on the other side their assets would show a very large deficiency, and bankruptcy would only be saved by the fact that the ratepayers might be rated without limit to make up for the deficiency. Here was the specific. It would never do to make arrangements for paying this deficit in 10 or 20 years. The sinking fund should be worked out over a period of, say, 55 or 60 years, at 1¼ per cent. In Dundee they were at present paying 4s. 5d. per ton for carbonizing coal; but the hope was that with the new machinery they would be able to reduce the cost to the neighbourhood of 2s. The capital account seemed to be excessive, when compared with those of other centres. With nearly £500,000 of capital carbonizing 65,000 tons of coal, it cost Dundee £8 of capital per ton of coal carbonized, instead of £2 in Glasgow and £4 10s. in Edinburgh. They were in a most extraordinary position; and it would have to be faced. It was obvious that they would have to lower the candle power from 26 to 20 or 16. By keeping up the candle power, they could not possibly have cheap gas. They must buy a different class of coal, sell more coke, and bury less refuse. Bailie Robertson, at the same meeting, said there was no question that the fault lay in the past management of the works in Dundee—that while in other places they were adopting modern machinery and modern methods, the Gas Managers and Gas Conveners in Dundee were content to plod on with the old fashion until they were outrun. He thought an exhaustive inquiry would have to be made into the whole system. Very strong statements were made at meetings last night. At one, Mr. Smith said that the supposed value of the gas-works was something like £380,000. What they believed to be the actual value was £182,000. They were therefore in a bankrupt condition. Ex-Provost Ballingall, the Convener of the Gas Committee, at another meeting, said that in Dundee they were some ten years behind all other towns in Scotland. Every pound of coal was handled in the most primitive manner. It was perfectly clear that they could not make gas so cheap as in Glasgow or Aberdeen. In Dundee, the cost of carbonizing and handling the coal was 4s. 3d. per ton, in Glasgow it was only 1s. 10d., and in Aberdeen it was 1s. 11d. In the early part of his address, Mr. Ballingall said that the new retort-house would have been finished, and they would now have been getting the benefit of cheaper gas, if it had not been for the obstruction of Mr. Brownlee (his predecessor in the convenership) and Mr. M'Crae (the Manager). "There would be less of ex-Provost Brownlee's, and his friend Mr. M'Crae's advice taken in the near future." He then went on to express his opinion that they should take the advice of Mr. Foulis in regard to the class of coal they should purchase. The "Dundee Courier" also this week publishes another special article on the subject, in which the estimates of the Gas Commissioners, or their methods of estimating, are severely handled; and the blame for the sore is put upon the Gas Commissioners.

Of course, it is the Gas Commissioners who are to blame. Some are clamouring for an inquiry. Well, a look at the minutes of the Commission, to go no further, will show that for some years the Manager has been desirous of having the works improved, but that he has been constantly thwarted, and the work delayed so long that much money has been lost. I do not like ex-Provost Ballingall's remarks. He seems to be out of sympathy with Mr. M'Crae; and he ought, therefore, to retire. There are, indeed, too many ex-Provosts in the Dundee Town Council. Such men are always enamoured of whatever arrangements existed when they were Provost. It is my experience that a man who has been once the head of a municipality scarcely ever makes a good common councillor again. When his term of office is past, a man should retire into private life. I am sick of this washing of dirty linen in public in Dundee, and am thankful that it is nearly over. The pity is that the public men who have been taking part in the work do not seem to see how they have been exposing their own incompetence.

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Nov.* 3.

Sulphate of Ammonia.—The weakness observed at the end of last week developed into a sharp decline in values; and the closing quotations are £10 11s. 3d. per ton f.o.b. Hull and Leith, and £10 13s. 9d. to £10 15s. f.o.b. Liverpool. The mischief has been brought about mainly by the anxiety of middlemen to realize, not only abroad, but on the home markets, and especially in Scotland; speculative purchases made in October causing buyers to retire from the market. Makers, being well sold in October, have not been prominent as sellers; but towards the close larger supplies are being offered at first hand. There is still considerable inquiry for spring months; but makers maintain their quotations in this position notwithstanding the weak spot market, while buyers will only operate at a substantial decline.

Nitrate of Soda is firm at 8s. 3d. to 8s. 6d. per cwt., according to quality, on spot, while for spring months the quotations are 8s. 7½d. to 8s. 9d.

LONDON, *Nov.* 3.

Tar Products.—Business is a little steadier; and though one or two of the principal products somewhat drag, there is a tendency to firmness in the others. Benzol continues in excellent inquiry; but there is no further advance in value, although there is still a marked difference between quotations at the various points of production. The question of carrying benzol by rail is exercising makers very much; the railway restrictions in some instances being very adverse to facilitating trade in the article. Carbolic acid is, if anything, a little better, with more genuine demand. Crude naphtha and other naphthas are dull. Creosote is realizing a little higher price. Anthracene shows no change; and pitch,

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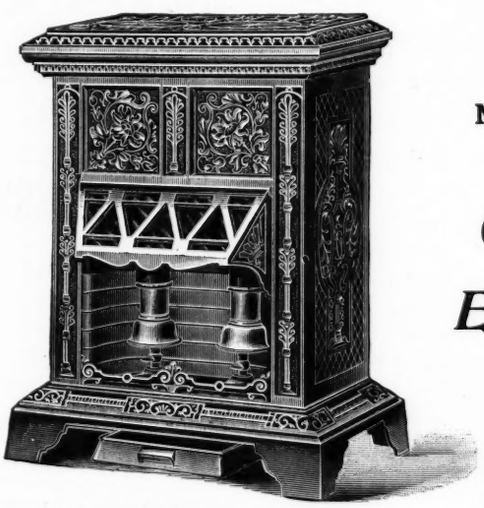

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if anything, is better. The difficulty in respect to freights for pitch is hampering shipments.

The week's values may be taken at: Tar, 15s. to 21s. Pitch, east coast, 35s. 6d.; west coast, 32s. 6d. Benzol, 90's, 10d. to 11d.; 50's, 1s. 1d. Toluol, 1s. 3d. Solvent naphtha, 1s. 2d. Crude naphtha, 5d. Heavy naphtha, 1s. Creosote, 2d. Heavy oils, 2¾d. Carbolic acid, 60's, 2s. 8d. Naphthalene, 80s.; salts, 60s. Anthracene nominal, "A," 3¾d.; "B," 2¼d.

Sulphate of Ammonia has fluctuated a good deal during the week, oscillating between £10 10s. and £10 15s. per ton. The week closes, however, with a good deal of inquiry, and, after some weakness for a day or two, an inclination to better business. The average value may be taken at all ports at about £10 13s. 9d., less 3½ per cent.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—Although list rates in the Manchester district remain unchanged, the coal trade here is barely maintaining its position; and this is specially noticeable in the quotations that are now being made for renewal contracts, which collieries are showing a disposition to accept at substantially lower prices than they would have entertained a month or two back. The weakening for the present is, however, rather coming from the outside than from within; but the market is undoubtedly being very considerably unsettled by the keen competition of surplus supplies of both round coal and engine fuel, which collieries from other districts are offering here at very much below the quotations of Lancashire collieries for similar classes of fuel. There are also some extraordinarily low quotations just now being made from outside districts for cannel. In the better qualities of round coal, a fairly good demand is kept up, which is taking away pretty nearly all the present restricted output. Stocks are therefore not increasing to any material extent; and collieries are able to hold firmly to their list basis rates of 16s. 6d. to 17s. 6d. per ton at the pit for best Wigan Arley, 15s. to 15s. 6d. for Pemberton four-feet and seconds Arley, and 14s. to 14s. 6d. for common house coal. Occasional lots of house coal, however, are to be bought from outside districts, more particularly Yorkshire, at specially low-cut prices. Steam coals generally meet with a tolerably ready sale, as notwithstanding a somewhat lessened inland demand, the shipping trade is still taking away fairly large quantities, and sufficient to relieve collieries of any surplus common round coal they may have to offer, at better prices than are obtainable on inland sales. At the pit, steam and forge coals are quoted inland at about 12s. 6d. to 13s. per ton. For shipment, 16s. to 16s. 6d. for ordinary, up to 17s. for some special qualities, delivered at the ports on the Mersey, is being obtained. Slack continues plentiful on the market, with cheap lots offering; and it seems very doubtful whether Lancashire collieries will be able to much longer hold on to their present list basis, unless there is a very decided improvement in the cotton trade. At the pit, they are still quoting on the basis of 10s. 6d. to 11s. per ton; but some of the non-associated collieries are taking 6d. to 1s. less, and on forward contracts quotations are now being made at 1s. to 1s. 6d. below the present list basis.

Northern Coal Trade.—The coal trade has been somewhat irregular of late; and on the whole this has led to rather lower prices. In the steam coal trade, there has been enough work to keep the collieries well employed; but future orders are only obtained by some concession in the prices. Best Northumbrian steam coals are from 16s. 9d. to 17s. 3d. per ton f.o.b., and steam smalls are 9s. 6d. to 9s. 9d.; the latter kind being very plentiful. Manufacturing coals are steady; but buyers hold off from new contracts, as they seem to expect lower prices before the end of the year. In the gas coal trade, there is an increasing demand on contracts; and the deliveries will soon be at the highest point for the year. Gas companies seem to have a fair stock; and there is not the pressure for supplies that there was in the November of last year. For occasional cargoes, the price quoted is from 16s. 6d. to 17s. per ton f.o.b.; but there is not, after meeting the contracts, much coal left for such sale. In the coke trade, there is rather a recovery in prices; and for best coke for export the quotation is from 24s. to 26s. per ton f.o.b., while blast-furnace coke is about 25s. per ton at the Teesside furnaces. Gas coke is steady in price, at about 24s. to 25s. per ton f.o.b. The production is now increasing, and exports are only maintained; so that the stocks may begin to grow soon.

Scotch Coal Trade.—There has been a considerable fall in prices. It is beyond question that the price of coal has been forced this year beyond what is maintainable; and the result has been the shortening, by every means possible, of the consumption. Men are being dismissed from employment; and many of these, as well as thousands who are being discharged from the army, will find their way into the coal pits, where wages are higher than they are anywhere else. The reaction which has set in will probably develop rapidly, as coalowners will be immediately at sixes and sevens, in their endeavours to avoid losses in the falling market. The prices quoted are: Main 14s. to 14s. 3d. per ton f.o.b. Glasgow, ell 14s. 6d. to 16s., and splint 16s. to 16s. 6d. The shipments for the week amounted to 206,357 tons—a decrease of 21,162 tons when compared with the preceding week, but an increase of 31,190 tons over the corresponding week of last year. For the year to date, the total shipments have been 9,146,501 tons—an increase of 1,807,266 tons upon the same period of last year.

Barry Gas-Works Extensions.—The Gas and Water Committee of the Barry District Council last Tuesday passed plans of a new retort-house, to cost about £10,000; and application was ordered to be made to the Local Government Board for permission to borrow the money.

Cumberland Water-Works Scheme.—A meeting of the property owners and ratepayers in Wigton and district was held last Tuesday to consider the proposal to join in the scheme for tapping the sources of the Upper Ellen and Lake Overwater to provide a water supply; the cost being estimated at £30,000. After an animated discussion, the motion in support of the project was carried by a majority of 47 votes.

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Lambeth Water-Works Company.—The Directors have decided, subject to audit, to transfer £3000 to the contingency fund, and to recommend the payment of dividends for the past half year at the prescribed rates of 10 per cent. and 7½ per cent. per annum respectively on the share capital, together with a further payment at the rate of ½ per cent. per annum on all the share capital on account of arrears of previous dividends; leaving a balance of £5962 to be carried forward, after making provision for the statutory payment to the Chamberlain's sinking fund.

Failure of the Gas Supply at Pontypridd.—Just before ten o'clock on Monday night last week the gas supply of Pontypridd failed. There was but a faint glimmer of light in the public lamps, and the main streets were almost in total darkness. There was not much improvement on Tuesday night; and during the evening circulars, signed on behalf of the District Council by Mr. Edward Jones, Manager of the Gas-Works, were distributed informing the public that owing to breakages in the main, caused by subsidences, a great quantity of gas had been lost, and a full supply could not be guaranteed until Wednesday.

Damage to Property by Gas Explosions.—A destructive gas explosion occurred on Monday night last week in Glenarm Road, Lower Clapton, caused by a young man named Henry Blake seeking to trace a leakage of gas with a light, in the house of his father, Mr. T. E. Blake, which was completely wrecked, and subsequently set on fire. The force of the explosion was such that ten houses, some of them on the opposite side of the way, were damaged, though in a minor degree. Mr. Henry Blake, who is 23 years of age, was badly burnt about the face and hands, and was blown a considerable distance; while his father received slight injury. The local brigade quickly overcame the fire. On the previous day, an explosion, which did a good deal of damage to property and injured two persons, occurred at Ashton-under-Lyne. The affair happened in Hamilton Street about lighting-up time. It has been ascertained that the explosion was caused by an accumulation of gas under the floor of three houses, Nos. 88, 90, and 92. The report is said to have been terrific; and the neighbourhood was greatly startled. Each house was badly damaged; and No. 90 was set on fire. The fire brigade was soon on the spot; and, after considerable further damage had been done by water and flames, the fire was subdued. It was found that the leakage came from the street-main, and the pavement had to be taken up to obviate further disaster. William Haughton and his wife, who resided at No. 90, were both found badly cut about the head. An explosion of gas took place in the office of a firm of law agents, in Renfield Street, Glasgow, last Friday morning. When the office was opened a smell of gas was perceived. One of the partners put water into the gaselier, and then (it is said at the suggestion of his partner), before he descended from the chair upon which he was standing, he lighted a match and was applying it to the pipe, near the ceiling, when the explosion occurred. The windows of the apartment were blown out, the doors destroyed, and both partners injured—one by burning, and the other by falling glass. The leakage must have been near the roof, or the escaped gas had found its way upwards and collected. There must have been a large accumulation, for the first thing the clerk did on arriving at the office was to open the windows and turn off the gas at the meter.

Bradford Gas-Works Extensions.—The Bradford City Council last Wednesday confirmed their proposal to take steps to promote a Bill for various purposes in the ensuing session of Parliament. The Corporation, it may be remembered, intend to ask for power to extend the Birkshall and Valley Road Gas-Works; to enable them to manufacture and store gas on lands in their possession, but on which they are not at present authorized to manufacture and store gas; and to borrow the sum of £150,000 for carrying out these extensions, and other works in connection with the gas undertaking.

Bury Public Lighting.—In his annual report on the work of the Public Lighting Department of the Bury Corporation, the Superintendent (Mr. E. Geall) states that the quantity of gas consumed in the street-lamps during the past year was 26,837,900 cubic feet, which cost £2733 12s. 11d. In the course of the twelve months, 32 lamps were erected; bringing up the total to 2185. There are 31 arc lamps, each of 1000-candle power, and two 800-candle lamps—all in the principal thoroughfares; also 127 incandescent lights. The greater portion of the lamps burn 3285 hours perannum.

Lighting of Bude.—A scheme for the erection of works for the supply of gas to Bude and Stratton has recently been projected. A few weeks ago, Messrs. Willey and Co., of Exeter, wrote to the District Council for permission to lay and maintain mains; mentioning that they were supported by many of the principal inhabitants. The Council appear to have been in doubt as to whether they had power to grant permission, and, in any case, decided to refuse it. The ground for the refusal is that, if their projected water scheme receives the sanction of Parliament, it is intended to use the surplus water power as a means of supplying electric light.

Flamborough Water Supply.—At the monthly meeting of the Bridlington Rural District Council, the minutes of the Executive Committee showed that the members had again had under consideration the question of the water supply of Flamborough, following a letter read at the previous meeting from the Local Government Board. The Parish Council of Flamborough have repeatedly stated that the water supply to the village is ample and good. The letter of the Department intimated that the Rural District Council, and not the Parish Council, were responsible for the provision of an adequate supply of water to every occupied house, and stated that "having pointed out the Rural Council's statutory duties in this respect, the Local Government Board could only say that, in their opinion, a serious responsibility would rest upon the Rural Council should they continue to neglect to secure to Flamborough an adequate supply of wholesome water." The Executive Committee had instructed the Sanitary Inspector to make a special inspection of the parish of Flamborough, and to mark every pump and cistern in the village on a 25-inch map of the Ordnance survey, at the same time instructing the Clerk to inform the Department of the course taken. Mr. Simpson, in moving the adoption of the minutes, said the question of the supply of water to Flamborough necessitated, and was receiving, the careful consideration of the Committee. The step taken would, he hoped, enable them to furnish the Department with all the information it desired. The motion was carried.

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WINDSOR ST. WORKS, BIRMINGHAM	2,000,000
SALTLEY WORKS, BIRMINGHAM	2,000,000
COLCHESTER	300,000
BIRKENHEAD	2,250,000
SWINDON (New Swindon Gas Co.)	120,000
SALTLEY, BIRMINGHAM (Second Contract)	2,000,000
WINDSOR ST., BIRMINGHAM (Second Cont.)	2,000,000
HALIFAX	1,000,000
TORONTO	250,000
OTTAWA	250,000
LINDSAY (Remodelled)	125,000
MONTREAL	500,000
TORONTO (Second Contract; Remodelled)	2,000,000
BELLEVILLE	250,000
OTTAWA (Second Contract)	250,000
BRANTFORD (Remodelled)	200,000
ST. CATHERINES (Remodelled)	250,000
KINGSTON, PA.	125,000
PETERBOROUGH, ONT.	250,000
WILKESBARRE, PA.	750,000
ST. CATHERINES (Second Contract)	250,000
BUFFALO, N.Y.	2,000,000

	Cubic Feet Daily.
WINNIPEG, MAN.	500,000
COLCHESTER (Second Contract)	300,000
YORK	750,000
ROCHESTER	500,000
KINGSTON, ONT.,	300,000
CRYSTAL PALACE DISTRICT	2,000,000
DULUTH, MINN.	300,000
CATERHAM	150,000
LEICESTER	2,000,000
ENSCHEDE (HOLLAND)	150,000
BUENOS AYRES (RIVER PLATE CO.)	700,000
BURNLEY	1,500,000
KINGSTON-ON-THAMES	1,750,000
ACCRINGTON	500,000
TONBRIDGE	300,000
STRETFORD	500,000
OLDBURY	300,000
TODMORDEN	500,000
SALTLEY, BIRMINGHAM (Third Contract)	2,000,000
YORK (Second Contract)	750,000
ROCHESTER (Second Contract)	500,000
NEWPORT (MON.)	250,000
TOKIO, JAPAN	1,000,000

Complete Gas-Works at NELSON, BRITISH COLUMBIA.

The Local Government Board and the Supply of Water Gas.—The "Local Government Journal" says on the above subject: "There seems little prospect at present of any local authority obtaining the sanction of the Local Government Board to loans for the establishment of water-gas plant. To every application which is made, the Board reply that a Departmental Committee was appointed some time ago to inquire into and report upon the extent to which the gas is used, the danger attending its manufacture and use, and the means by which the danger can be guarded against; and that until the report which has been made has been finally considered, they are not prepared to take the responsibility of sanctioning loans for the purpose. It is understood that the delay is partly attributable to the Board of Trade, and that legislation is contemplated."

Projected New Gas-Works at Portsmouth.—The Portsea Island Gas Company are proposing shortly to expend a quarter of a million of money upon a very large extension of their works, for which additional capital is to be raised, and an application made to the Board of Trade for a Provisional Order to sanction it. The new works are to be in addition to those at Landport, and are to be erected on a site at Copnor, in the parish of Cosham. They will be available both for manufacturing gas and storing coke, oil, tar, pitch, and other chemical products. The scheme will include the erection of dwellings for the workmen and other persons employed by the Company. The extension has become absolutely necessary owing to the strain put upon the Company during the last ten or fifteen years by the great increase of the borough—the erection of dwellings having gone on in all directions.

York Streets Again in Darkness.—Attention is again being called to the absence of electric light in York streets, to which reference was made in the "JOURNAL" last week. Alderman R. H. Vernon Wragge, who is a member of the Electric Lighting Committee of the Corporation, has written to the "Yorkshire Herald," under date of Nov. 2, as follows: "Last night, Market Street and Spurriergate were in pitch darkness. On Tuesday last, I drew attention, at the Streets and Buildings Committee, to the previous occasion, about a fortnight ago, and moved the following resolution: 'That in future, when the person in charge finds that the electric light will not be on in any district that night, notice should be sent to the gas-works to light the lamps.' Instead of that resolution being carried, the following amendment was moved and carried in its place: 'That the police be requested in future to report when the electric light fails, the same as gas.' Where the remedy for the darkness comes in by this precious amendment I fail to see; but it gives some idea of the way public business is transacted. Perhaps, after some crime has been committed under the cover of the darkness, our sage rulers will wake up to the fact that it is scarcely meeting the requirement of the case for the Streets and Buildings Committee to receive a report from the police, a fortnight after the event, that the electric light has failed. I am not complaining about the Electric Lighting Committee. Rome was not built in a day, and we cannot expect everything perfect in a moment; but surely, until perfection is attained, failure should be anticipated and provided for."

A Water Scheme for Kettering.—A town's meeting at Kettering has confirmed the intention of the District Council to promote a Bill in Parliament for conferring power to carry out an extensive water scheme. According to a report by Mr. Mansergh, the extension consists of enlarging the reservoir at Cransley, and establishing a new one at Loddington; the total cost being estimated at £150,000.

Bovey Tracey Water Supply.—As the result of the recent inquiry respecting the proposal of the Newton Abbot Rural District Council to borrow £3000 for the purpose of improving the water supply of Bovey Tracey, the Local Government Board have suggested that, before constructing a new reservoir, the Council should take steps to increase the efficiency of the existing works. A new 4-inch main should be laid to the reservoir, in continuation of the 4-inch main from the springs; and the reservoir should be repaired so as to allow of its being filled to the utmost capacity. No portion of the supply to consumers should be drawn from the main supplying the reservoir. If these works were inadequate, a second reservoir could be provided; but it would probably be sufficient to have one of considerably less capacity than that now proposed. The District Council discussed these suggestions last week, and came to the conclusion that they were inadequate. Steps are to be taken with a view to formulating a fresh scheme. With regard to the supply of water to several hamlets in the neighbourhood of Bovey Tracey, the Local Government Board suggested the employment of a competent water engineer to advise the Council on the subject, in both its geological and engineering aspects. It has been decided to apply to the Geological Survey Department for advice as to the expense of an expert.

Bude and Stratton Water Supply.—After an agitation extending over many years, it has been decided to seek parliamentary powers for the provision of a supply of water for Bude and Stratton. The proposed source is a reservoir with an area of about 80 acres, the property of the Bude Harbour and Canal Company. Alternative schemes were proposed for the consideration of the District Council and the ratepayers. Under the first, the Council had the option of purchasing the whole property of the Canal Company for £8000. Under the second, they were offered a lease with the right to take water at the following prices: 3d. per 1000 gallons up to 20 million gallons per annum, 2d. per 1000 up to 30 millions, and 1d. per 1000 for all in excess of that quantity. In order to make the water available, it will be necessary, in either case, to lay mains and construct works, the estimated cost of which is £12,500. The District Council, at a statutory meeting last Wednesday, decided to take steps for the promotion of a Bill for the purchase of the Canal Company's undertaking; and the decision was confirmed by a meeting of the ratepayers held afterwards. It is calculated that the present requirements of the district are 90,000 gallons a day, or 33 million gallons per annum. Mr. J. Treleaven, Chairman of the District Council, laid before the meeting statistics which showed that the annual cost of this quantity of water under the leasing scheme would be £1136, whereas the purchase of the undertaking might be effected at a cost of £1052 per annum. The income from water supply is estimated at £500; and to make up the deficit on the cheaper scheme a rate of 1s. 6d. in the pound must be levied.

RICHMOND'S

"TRIUMPH"

"SOMETHING REALLY NEW."

RICHMOND'S

"A WINTER'S TALE."

Projected New Water Scheme for Harrogate.—At a special meeting last Wednesday, the Harrogate Corporation unanimously resolved to promote a Bill in the next session of Parliament for powers to construct additional works to secure a supply of water from the Agill and the Arnagill tributaries of the River Burn, on the estate of Lord Masham in the North Riding. Alderman Fortune, in proposing that the Bill be promoted, said it was necessary that they should move in connection with their water supply at once. Leeds, he said, objected to Harrogate taking that portion of the Burn which they contemplated doing. They had pointed out to the Leeds Corporation that in taking the 3000 acres of gathering-ground, they left Leeds 23,000 acres—more than double their present supply. There will be strong opposition from Leeds.

Manchester and the Water Supply of Salford.—At a recent meeting of the General Purposes Committee of the Salford Corporation, it was decided to promote a Bill in the ensuing session of Parliament to "place an obligation on the Manches'er Corporation to supply to the Salford Corporation, at a price to be fixed by an independent authority, such quantity of water as they may require for all purposes, in addition to the 2 million gallons specified in the Acts contained in the schedule to the Salford Improvement Act, 1862." Salford is almost entirely dependent for water upon Manchester; and the Corporation have entered into agreements with the borough from time to time to supply at sums varying from 3d. to 9d. per 1000 gallons. Insufficient water pressure in cases of fire, and the fact that Manchester has raised the charge to 9d. per 1000 gallons—which is considered by Salford to be exorbitant—led to the appointment of the Committee, who recommended the Council to adopt the course proposed.

A Water Scheme for Stockport.—With a view to meeting future requirements, the Corporation of Stockport decided, at a private meeting yesterday week, to promote a Bill in Parliament for supplementing with a new source of supply the water undertaking recently purchased at a cost of £850,000 from the Stockport Water Company. The estimated cost of the new undertaking is about £520,000; but this expenditure would be spread over a number of years. The scheme contemplates a gathering-ground of 4000 acres in the neighbourhood of Kinderscout, from which it is hoped eventually to obtain a supply of some 4 million gallons per day. The route of conveyance includes Kinder, Hayfield, New Mills, Disley, to Poynton and Wilmslow. The area of supply by the Stockport Corporation also includes Alderley Edge, on the south side of the town. The district is growing rapidly; and it was imperative that those responsible for the water supply should make early provision for the daily increasing demands. It is not proposed to carry out the scheme at first in complete form, but to do so in three portions or instalments. The cost of the first will be £300,000, of the second £180,000, and of the third £45,000.

The Dangers of Overhead Wires.—News reached England last Saturday of a serious accident which happened in Vienna early on the previous morning. A telephone wire broke and fell upon the wire of the new electric tramway line. An elderly lady became entangled in the loose wire, and fell to the ground. A man who ran to her assistance staggered, and eventually fell; and a similar fate attended two other men who went to their rescue. The police were soon upon the spot, and the current was cut off. The injuries sustained by the man and woman who were first caught by the wire were so serious that both were taken to the hospital; but the other two victims were able to return to their homes after treatment. The Vienna correspondent of "The Times," referring to the accident, says: "The principal sufferer presented a ghastly appearance. The hanging wire had coiled round his neck, producing a deep circular wound. His hands and other parts of his body touched by the wire were severely scorched; his clothing and underlinen being burnt through." The current used for the tramway line is stated to be one of 500 volts; and the fact that it passed to the fallen telephone wire is explained by incomplete insulation.

Mr. Livesey Accused of Patronizing the Electric Light.—In a letter which appeared in the "Wrexham Advertiser" on the 27th ult., in the course of some correspondence on "Gas *v.* Electricity," a writer asserted that "the Chairman of the South Metropolitan Gas Company has for several years had his home lighted by electricity." Of course, everyone knowing Mr. Livesey would be well aware that the writer of the letter had got hold of the wrong man. However, that gentleman was not content to rest under the imputation, so he wrote to the Editor of the paper to correct the mistake. He said: "I never have had, and never shall have, an electric light in my house, and thus become a traitor to the business that has provided for me all my life, and my father before me. Gas, I am happy to say, has more than held its own, because, taking it all in all, it is the most useful and the cheapest form of artificial lighting. Had this not been so, it must have succumbed to the fierce competition of its rivals—one from the earth beneath and the other from the heavens above—during the last quarter of the century. It is even now fast driving the first from a field it had occupied and made its own—the houses of weekly tenants—by means of the slot meter; while the other is being driven back from its advance into the domain of public street lighting, as at Liverpool and elsewhere."

Messrs. Richmond and Co., Limited, sent their advertisement tableau, "Bringing his Goose to be Cooked," to the War Carnival at Andover on the 24th ult., and to Aldershot last Wednesday, in aid of Lady Audrey Buller's funds for the Soldiers' and Sailors' Families Association. At the latter place, they were awarded the second prize.

We have received from Messrs. W. F. Stanley and Co., Limited, of Great Turnstile, W.C., a copy of the latest (the seventh) edition of Mr. W. Ford Stanley's "Mathematical Drawing and Measuring Instruments." The book has been thoroughly revised, and much new matter added; simple means of producing forms by inexpensive apparatus being introduced where possible.

We have received from the Technical Publishing Company, Limited, Manchester, "The Practical Engineer" Pocket-Book for next year. This is the twelfth annual edition of the book, and among several new features which have been introduced may be mentioned a few special notes on entropy of gases in the section on "Gas and Oil Engines." The notes on the transmission of power by shafting, belting, &c., have been re-written, and additional tables given to facilitate the work of the designer.

C. & W. WALKER, Ltd.

Midland Iron-Works,

DONNINGTON, Near NEWPORT, SHROPSHIRE.

110, CANNON STREET, LONDON, E.C.

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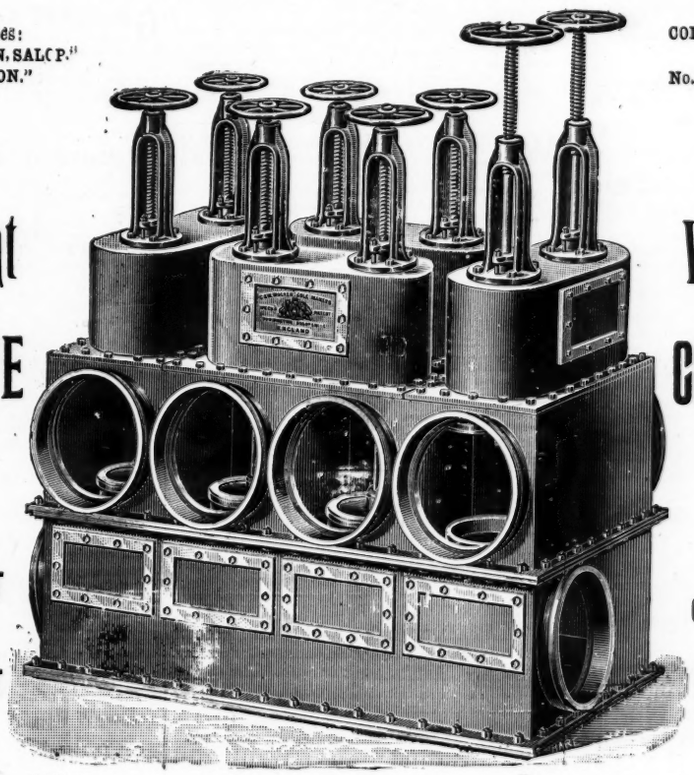
Weck's Patent CENTRE-VALVE



Weck's Patent CENTRE-VALVE

PERFECTLY TIGHT UNDER EVERY EXTREME OF HEAT OR COLD.

THE ONLY ABSOLUTELY RELIABLE CENTRE-VALVE IN THE MARKET.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of, PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale than all other Oxides combined. Purity and uniformity of quality guaranteed.

JOHN WM. O'NEILL, Managing Director,
160, 161, & 162, PALMERSTON BUILDINGS,
OLD BROAD STREET,
LONDON, E.C.

ANDREW STEPHENSON, AGENT. All communications *re* Oxide to the Company as above.

WINKELMANN'S

"VOLCANIC" FIRE CEMENT.

Resists 4500° Fahr. Best for use in GAS-WORKS.

ANDREW STEPHENSON,
182, Palmerston Buildings,
Old Broad Street,
"Volcanism, London." London, E.C.

BROTHERTON & CO.

Offices: Commercial Buildings, LEEDS. Correspondence invited.

ENRICH your Gas with cheap Benzol, Specially prepared, free from sulphur. At to-day's Price of Benzol, ILLUMINATING POWER costs less than ONE-THIRD OF A PENNY PER CANDLE. Apply to SADLER AND CO., MIDDLESBROUGH.

AMMONIACAL LIQUOR wanted.

BROTHERTON AND CO., Ammonia Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

SADLER & CO., Ltd., Middlesbrough, Tar Distillers and Tar Colour Manufacturers. BENZOL specially prepared for Gas Enrichment free from Sulphur. Pure Hydrated OXIDE OF IRON for Purifying Gas either for Sale or Lent on Hire. Always Buyers of GAS TAR and AMMONIACAL LIQUOR.

SULPHATE OF AMMONIA SATURATORS.

JOSEPH TAYLOR & CO., Chemical Plumbers, &c., and Makers of every description of Solid Plate Lead and Timber Cased Saturators, &c., CENTRAL PLUMBING WORKS, TOWN HALL SQUARE, BOLTON. Special attention to Repairs.
Before placing Orders, please write for Estimate.
Telegraphic Address: "SATURATORS, BOLTON."

GAS TAR wanted.

BROTHERTON AND CO., Tar Distillers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

PATENTS FOR INVENTIONS.

Messrs. J. C. CHAPMAN & CO., Chartered Patent Agents, ADVISE ON ALL MATTERS CONNECTED WITH ABOVE.
Information and Handbook on application,
70, CHANCERY LANE, LONDON, W.C.

SPECIAL PAINT FOR GAS-WORKS.

JOHN E. WILLIAMS AND CO.,
VICTORIA PAINT WORKS,
MANCHESTER.
Telegrams: "ENAMEL." National Telephone 1759.

JOHN RILEY & SONS, Chemical Manufacturers, Hapton, near Accrington, are MAKERS of SULPHURIC ACID, from Brimstone, for Sulphate of Ammonia Making. Highest percentage of Sulphate of Ammonia obtained from the use of this Vitriol. References given to Gas Companies.

SULPHURIC ACID for Sale.

BROTHERTON AND CO., Chemical Manufacturers. Works: BIRMINGHAM, LEEDS, and WAKEFIELD.

TO GAS AND WATER OFFICIALS.

HIGH-CLASS Cycles at reasonable and low Prices. Guaranteed for Twelve Months. Sent on approval. For Cash or Gradual Payment System. Send for Catalogue, Post Free.
MELROSE CYCLE COMPANY, COVENTRY.

HYDRATED OXIDE OF IRON.

PREPARED from Pure Iron.
Twice as Rich as Bog Ore.
Gives no Back Pressure.
The Cheapest in the Market.
Can be Lent on Hire.
Can be Exchanged for Spent Oxide.
READ HOLLIDAY AND SONS, LTD., HUDDERSFIELD.

PORTER & CO., Gowts Bridge Works, LINCOLN, Engineers, Ironfounders, and Contractors for the erection of Gas-Works for Towns, Villages, Mansions, Manufactories, Collieries, and Isolated Buildings at home and abroad. Manufacturers of Retorts and Fittings, Condensers, Scrubbers, Purifiers, Valves, &c.; also of Girders, Wrought and Cast Iron Tanks, Iron Roofs, &c.
Telegraphic Address: "PORTER, LINCOLN."
[For Illustrated Advertisement, see p. 1174.]

J. & J. BRADDOCK (Branch of Meters Limited), Globe Meter Works, OLDHAM; and 45 & 47, Westminster Bridge Road, LONDON, S.E.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
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JOHN NICHOLSON & SONS, Limited, Chemical Works, Leeds, specially produce this ACID from SULPHUR, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Waggons or Carboys. Highest references and all particulars supplied on application.

IMPORTANT NOTICE
TO ACCOUNTANTS OF GAS AND OTHER LARGE COMPANIES.

A GENTLEMAN, who has an Established Agency of Seven Years' standing for the CHANGING OF ENGLISH COPPER COIN, is prepared to take One Thousand Pounds' worth, or more, per week.
Address for Interview and to arrange Terms, J. A., 65, Lancefield Street, WEST KILBURN.

WANTED, a Situation as Manager or WORKS CLERK on a Gas-Works (South of England preferred). Age 30. Good References.
Address Mr. R. Goss, 1, Sunny View, Waterloo Road, Aldershot, HANTS.

RETORT-SETTER requires permanent Situation (at Home or Abroad). Used to Regenerator, Generator, and Direct-Fired Settings. Age 32. Total Abstainer.
Address No. 3589, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, a single Man as Night Man for the Hartley Wintney Gas-Works.
Apply to Mr. KENWARD, Hartley Wintney, Winchfield, HANTS., stating Wages and Reference.

WANTED, a good Gas-Fitter. Used to Iron and Compo.
State Age and Wages required to the SECRETARY Sheppy Gas Company, SHEERNESS-ON-SEA.

WANTED, at once, a good all-round GAS-FITTER and MAIN and SERVICE LAYER. One trained on a Gas-Works preferred.
Apply, J. DAVIES, Manager, Gas-Works, NANTWICH.

DRAUGHTSMAN wanted, with Experience in Elevating and Conveying Plant.
State, by letter, Age, Experience, and Salary, to No. 3593, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a Gas Engineering Firm, a thoroughly competent DRAUGHTSMAN, conversant with Retort-House Ironwork, Regenerative Settings, and Conveying and Elevating Plant.
State Age and Salary required to Box 2791, SELL'S, FLEET STREET, E.C.

WANTED, for a Suburban Gas Office, a reliable Man to read Meter Indices, to collect Coin from Prepayment Meters, and to make himself generally useful. Must have had previous Experience.
Apply, in own handwriting, to "GAS," care of Street's Agency, 30, CORNHILL, E.C.

DRAUGHTSMAN wanted for a Gas-Works in the North of England, with good all-round Experience.
Apply, immediately, by letter, stating Age, Salary, and full Particulars, to No. 3594, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

JUNIOR Clerk wanted by a large Provincial Gas and Water Company. £60 per annum to commence. Good Writer, smart at Figures, Shorthand preferred.
Apply, by letter, with three Testimonials, stating Age, Experience, &c., to No. 3592, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

WANTED, by a large Provincial Gas Company in the South of England, a smart, strong young Man to act as COLLECTOR and INSPECTOR. Commencing Wages, 26s. per week; promotion for a suitable Man.
Apply, by letter, to No. 3588, care of Mr. King, 11, Bolt Court, FLEET STREET, E.C.

ALDERSHOT GAS AND WATER COMPANY.

WANTED, a good, smart Clerk. Knowledge of Book-keeping and Shorthand necessary. Salary £80 per annum.
Application, in own Handwriting, stating Experience, and enclosing three *copies* of recent Testimonials, to be addressed to the undersigned.

R. W. EDWARDS,
Secretary.
Oct. 31, 1900.

GAS PURIFICATION.

OXIDE OF IRON BOG ORE.

BALE & CO.'S Oxide of uniform quality. SPECIAL FIRE CEMENT, OXIDE PAINTS, OILS, SULPHURIC ACID, &c.
120 and 121, NEWGATE STREET, LONDON, E.C.
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JOHN ROMANS & SON, EDINBURGH, Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS and WATER WORKS.
Prices, &c., will be forwarded on application.
No. 30, ST. ANDREW SQUARE, EDINBURGH, } SCOTLAND.
NEWTON GRANGE, NEWBATTLE, DALKEITH, }

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WANTED, by the Wellington (Salop) Coal and Gaslight Company, a SMART YOUNG MAN who would be willing to make himself useful (Meter Inspection and Service Laying).
Two *bonâ-fide* References required. State Wages expected.

H. TAPLAY,
Engineer and Manager.
Gas Offices, Wellington,
Nov. 2, 1900.

TO BE LET on Hire—
FACING MACHINE, for facing *in situ* Self-Sealing Retort Mouthpieces any shape or size, ○, Oval, or Circular.
PULSOMETER, Size No. 5, with 4-in. suction and 3-in. delivery. Steam-Pipe ¾ in. diameter. Discharge 10,000 Gallons per hour.
Write J. WRIGHT, Bridge House, BLACKFRIARS BRIDGE, E.C.

"CUTLER'S" Condenser, ¾ million day, equal to new; weight 12 tons; accept £100 on rail, Berkshire, if sold promptly.
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SCRUBBER—For immediate disposal, a 4-feet CAST-IRON SCRUBBER, 24 feet high, in excellent condition, with Wood Grids.
For Price and Particulars, apply to R. S. CHURCH, Engineer, Gas-Works, CHICHESTER.

HIGH-PRICED COAL.

SMALL Gas-Works Authorities should immediately adopt an EXHAUSTER, and thus make probably at least 750 cubic feet of gas more from each ton of Coal carbonized. Several small sets *in stock*, both New and Second-hand.
Address J. FIRTH BLAKELEY AND CO., Thornhill, DEWSBURY.

GAS PLANT for Sale—I can always offer NEW and SECOND-HAND GAS APPARATUS, including Retorts and Fittings, Condensers, Exhausters, Scrubbers, Washers, Purifiers, Gasholders, Tanks, Valves, Connections, &c. Also a few COMPLETE WORKS. Compare Prices and Particulars before ordering elsewhere.
J. F. BLAKELEY, Gas Engineer, Thornhill, DEWSBURY.

J. FIRTH BLAKELEY & CO., Thornhill, Dewsbury, have FOR SALE:—
One Set of Three 6-ft. PURIFIERS.
One " Two 8-ft. "
One " Four 8-ft. "
One " Four 16-ft. by 12-ft. PURIFIERS.
Four 5-inch ANNULAR CONDENSERS.
Four 10-inch " "
Six 16-inch " "
"Cutler" ¾ million WATER CONDENSER.
Wrought-Iron TOWER SCRUBBERS, 3 ft. by 14 ft., 3 ft. 6 in. by 27 ft., and 7 ft. by 32 ft.
Cast-Iron TOWER SCRUBBERS, 3 ft. 6 in., 5 ft., and 6 ft. diameter.
EXHAUSTERS, 2000 to 60,000 Cubic Feet per hour.
"Holmes" & "Clapham" WASHER-SCRUBBERS.
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4-in., 6-in., 8-in., and 10-in. STATION METERS.
Splendid GASHOLDER, 50 ft. by 20 ft.
RETORT IRONWORK, MODERN HYDRAULICS.
Telegrams: "BLAKELEY, THORNHILL LEES."

ALDERSHOT GAS AND WATER COMPANY.

PURCHASE OF SURPLUS TAR.

THE Directors are prepared to consider OFFERS for the purchase of surplus TAR (about 1000 Tons), produced at their Gas-Works, Ash Road, Aldershot, S.W. Rly., and North Camp, Farnborough, S.E. Rly., for a Year from the 1st of January, 1901, to the 31st of December, 1901.
Specification and Conditions can be obtained on application per post.
Tenders to be sent in to the undersigned, endorsed "Purchase of Surplus Tar," to arrive not later than Wednesday, Nine a.m., the 21st of November, 1900.
The highest or any Tender not necessarily accepted.

By order,
R. W. EDWARDS,
Secretary.
Oct. 12, 1900.

CITY OF BRADFORD.
(GAS DEPARTMENT.)

TO RETORT MANUFACTURERS.

THE Bradford Corporation are prepared to receive TENDERS for the supply of RETORTS, and of FIRE-BRICKS and FIRE-CLAY required in the fixing of such Retorts during the Year 1901.

Form of Tender may be obtained on application at the Gas Office, Town Hall, Bradford.

Tenders, endorsed "Tender for Retorts," to be sent to me on or before Wednesday, the 14th of November next.

Persons tendering must give an assurance that they have paid to their Workmen for the Three Months preceding date of Tender not less than the Minimum Standard Rate of Wages, and undertake to continue to pay, during the Contract, the same rate of Wages.

The lowest or any Tender will not necessarily be accepted.

FREDERICK STEVENS,
Town Clerk.

Town Clerk's Office, Bradford,
Oct. 24, 1900.

ORIENTAL GAS COMPANY, LIMITED.

NOTICE is Hereby Given, that the ORDINARY GENERAL MEETING of the Shareholders of this Company will be held at the Offices of the Company, Finsbury House, Blomfield Street, London, E.C., on Wednesday, the 14th day of November, 1900, at half-past Twelve o'clock precisely.

The Directors who retire are Messieurs John Blacket Gill and Archibald Tennent Eastman. The Auditors, Messieurs S. W. Savage and W. Williams, also retire. All are eligible for re-election, and offer themselves accordingly.

By order of the Board,
H. J. LUFF,
Secretary.

Finsbury House, Blomfield Street,
London, E.C., Oct. 31, 1900.

N.B.—The Transfer Books will be closed from the 14th of November to the 4th of December, both inclusive.

SCARBOROUGH GAS COMPANY.

SALE BY TENDER OF NEW ORDINARY STOCK.

IN PURSUANCE OF THE SCARBOROUGH GAS ACT, 1895.

NOTICE is Hereby Given, that it is the intention of the Directors of this Company to SELL BY TENDER NEW ORDINARY STOCK of the Company, to the amount of £8000, or such greater or less amount as shall, with premiums, realize the sum of £9757 10s. 3d., such Stock to bear a maximum Dividend of £5 per cent. per annum, and to be paid up in full on or before the 1st day of January, 1901; being the balance of the Additional Capital authorized to be raised under the powers of the above-named Act, by a Resolution passed at a Meeting of the Proprietors of the Company, specially convened for the purpose, and held on the 26th day of June, 1895.

Particulars and Condition of Tender may be obtained on application at this Office; and sealed Tenders must be sent in not later than Twelve o'clock at noon on the 1st day of December, 1900.

By order,
J. HOLLIDAY,
Secretary.

Scarborough Gas Company's Offices,
32, Westborough, Scarborough, Oct. 22, 1900.

THE BRISTOL GAS COMPANY.

IMPORTANT ISSUE OF
GENERAL CAPITAL STOCK
AND
NEW DEBENTURE STOCK.

GEO. NICHOLS, HOWES, YOUNG, ALDER, & CO. are instructed to SELL by PUBLIC AUCTION, at their Sale-Rooms, 49, Broad Street, Bristol, on Thursday, the 22nd day of November, 1900, at Three p.m. precisely,

IN LOTS OF £100 EACH,
£13,000
FIVE PER CENT. MAXIMUM
GENERAL CAPITAL STOCK
AND
£6300
NEW DEBENTURE STOCK
(Bearing
INTEREST AT THE RATE OF FOUR POUNDS PER CENTUM PER ANNUM, payable Half-Yearly in June and December),
OF AND IN
THE BRISTOL GAS COMPANY,

Issued by the Company under their Statutory Powers.

The Stock will be Sold and Registered in the Books of the Company *Free of every Expense* to Purchasers thereof.

Full Particulars and Conditions of Sale may be obtained of the Auctioneers, 49, Broad Street, Bristol; Messrs. Brittan, Livett, and Miller, Solicitors, Albion Chambers, Bristol; or of

JOHN PHILLIPS,
Secretary.

Chief Office: Canons' Marsh, Bristol.

PRICE'S COKE & COAL BARROW

effects a great saving of time, labour, and expense.

For Particulars Price, &c., apply to Mr. EDWARD PRICE, 119, Queen's Road, FINSBURY PARK, N.

Prices are Reduced.

SALES BY AUCTION OF GAS AND WATER STOCKS AND SHARES.

MR. ALFRED RICHARDS begs to notify that his AUCTIONS of STOCKS and SHARES in London, Suburban, and Provincial Gas and Water Companies are held PERIODICALLY, at the Mart, Tokenhouse Yard, E.C.

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Terms for issuing such Capital, and also for including Gas and Water Stocks and Shares in these periodical Sales, can be obtained on application at Mr. ALFRED RICHARDS' OFFICES, 18, FINSBURY CIRCUS, E.C.

By order of the Directors of the
WANDSWORTH AND PUTNEY GASLIGHT AND COKE COMPANY.

NEW ISSUE OF £30,000 NEW ORDINARY STOCK.

MR. ALFRED RICHARDS will Sell by AUCTION at the Mart, E.C., on Tuesday, Nov. 13, at Two o'clock, in Lots.

£30,000 of NEW ORDINARY STOCK

in the above Undertaking, ranking for a Standard Dividend of 3½ per cent., subject to the Sliding-Scale, and entitled under the present price charged for Gas to a Dividend of £5 1s. 6d. per cent.

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By EDWIN FOX and BOUSFIELD.
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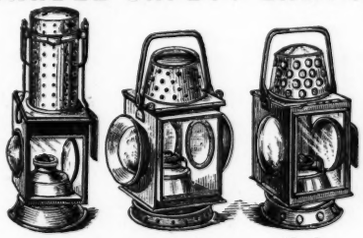

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Present Daily Produce over 8000 Tons.
Latest Analysis—By CHARLES PHILLIPS, Gas Examiner to Rotherham Corporation

Yield of Gas per Ton . . . 11,205 Cubic Feet.
Illuminating Power 16 1/10 Stand. Sperm. Candl.
Coke (of good & pure quality) 13¾ Cwt. per Ton.
Sulphur . . . . . A little over 1 per Cent.
Ash . . . . . Under 1 per Cent.
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Illuminating Power . . 16·9 Candles.
Coke . . . . . 66·7 Coke.
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Mr. JOHN PATTINSON, F.I.C., F.C.S.

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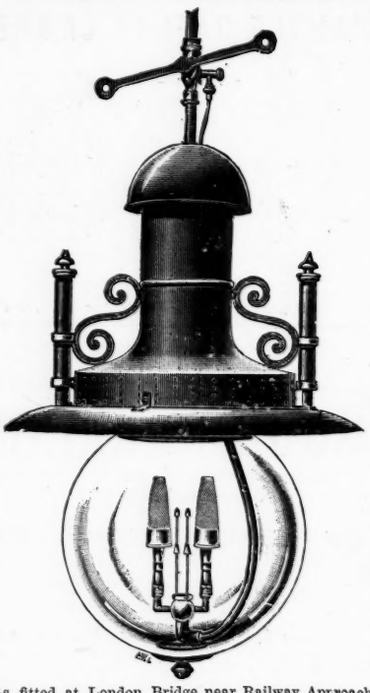
THE PATENT
"BEACON" GLOBE LAMP.

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OUT OF THEIR
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Yield of Gas per Ton . . 10,500 Cub. Ft.
Illuminating Power . . . 16·9 Candles.
Coke (of good quality) . . 67·5 per Cent.
Sulphur . . . . . 0·58 „
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FROM THE
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Yield of Gas per ton . . . . 10,500 cub. ft.
Illuminating Power . . . . 17·8 candles.
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Yield of Gas per ton . . . . 10,500 cub. ft.
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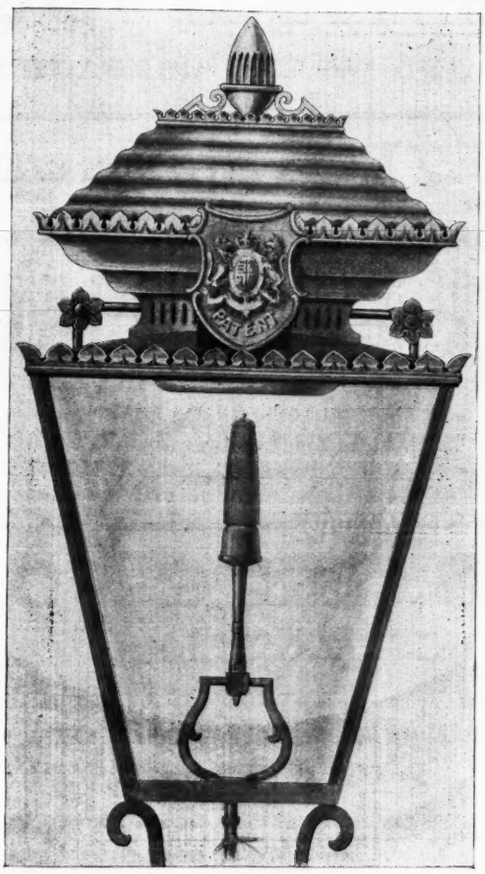

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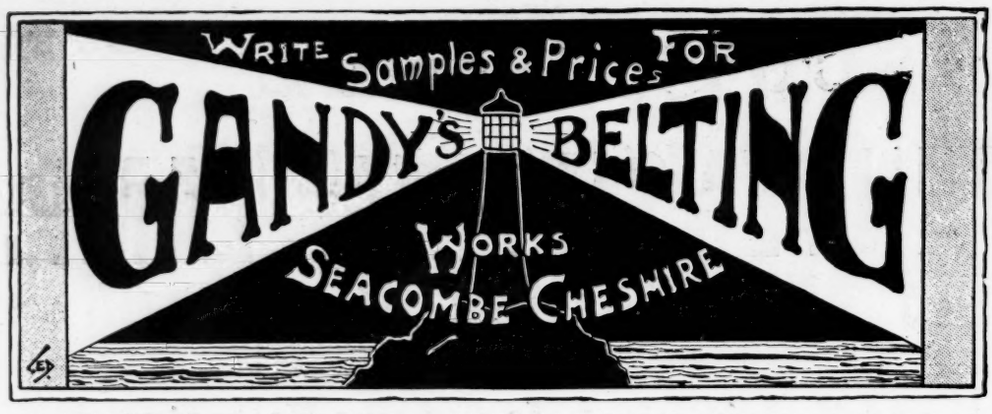

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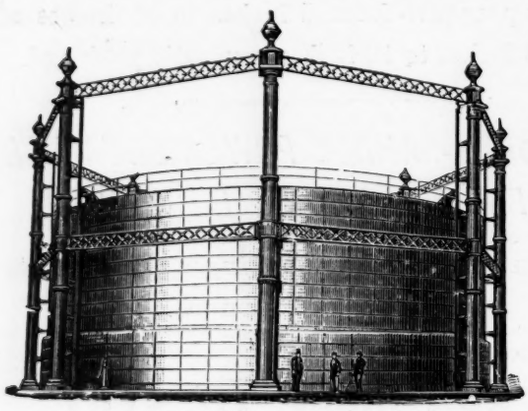

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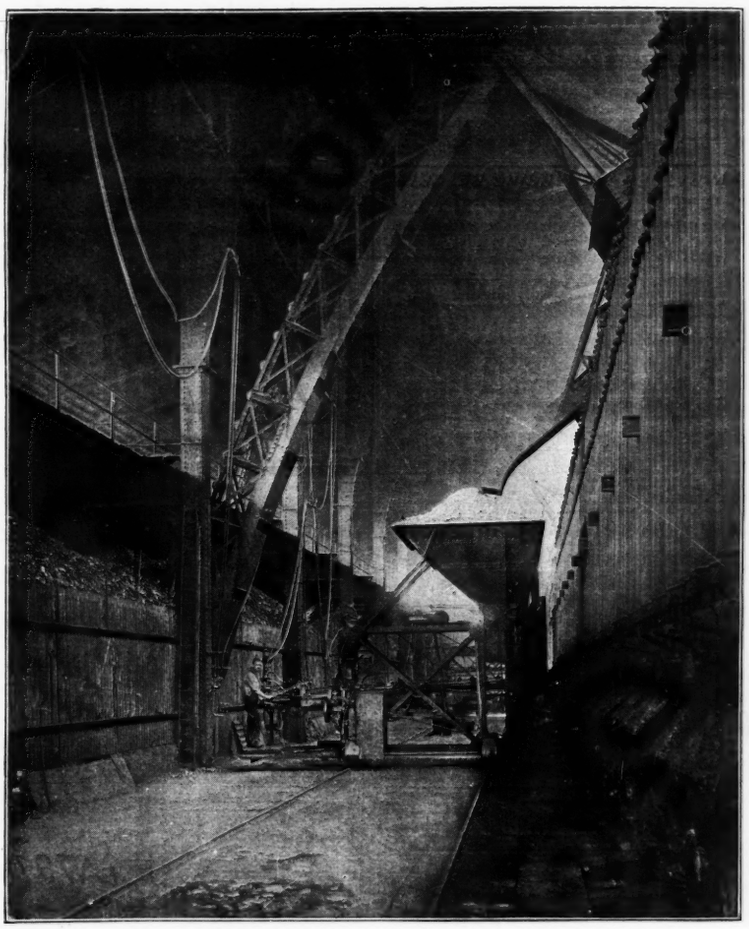

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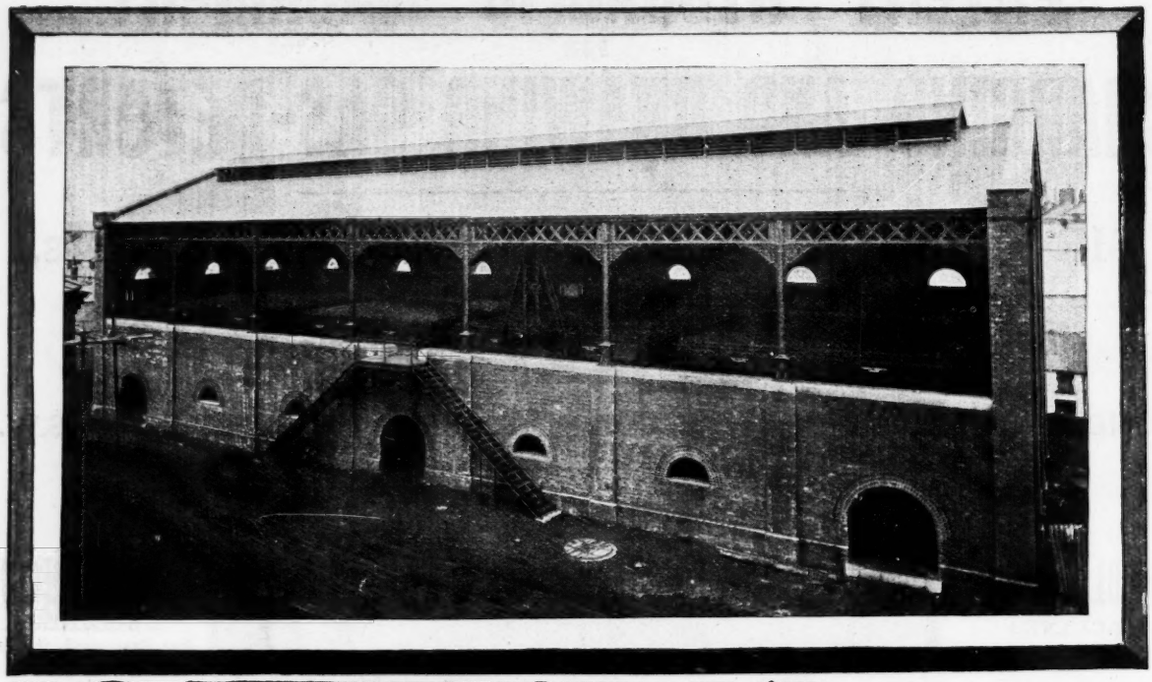

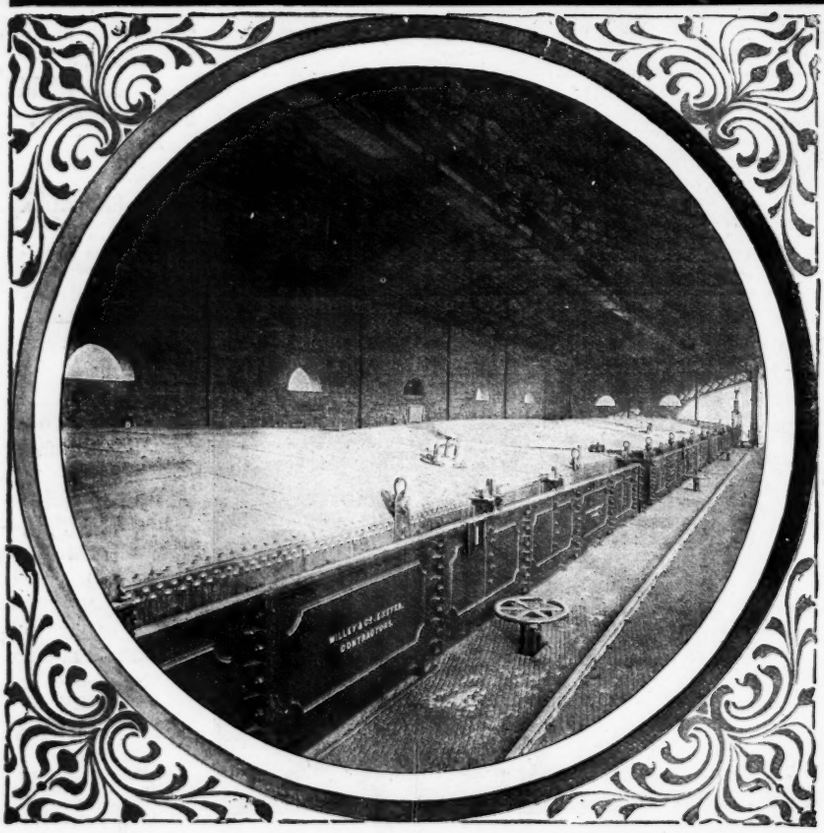

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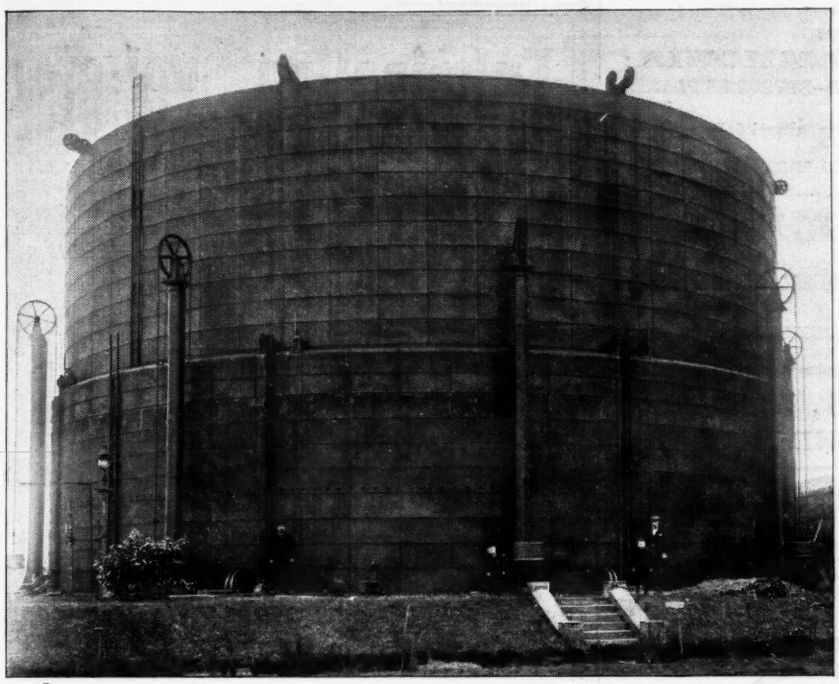

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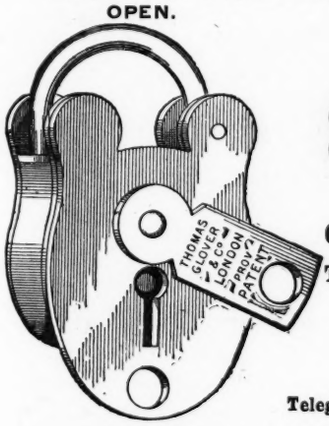

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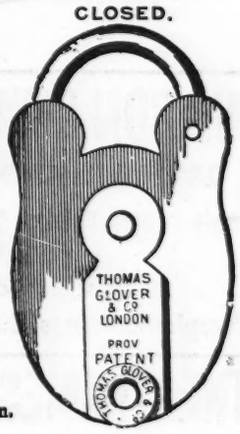

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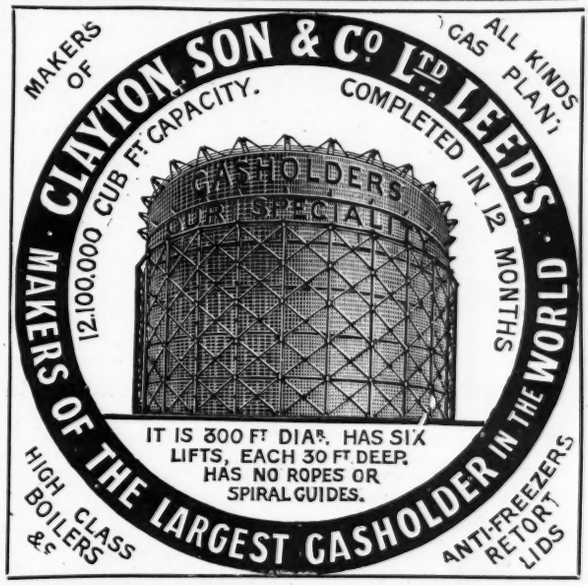
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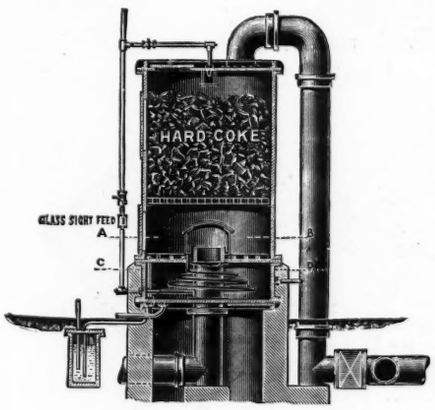

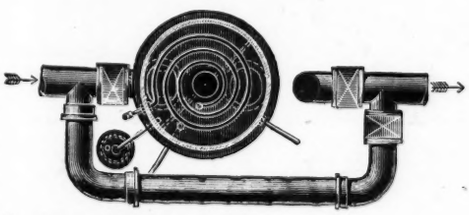

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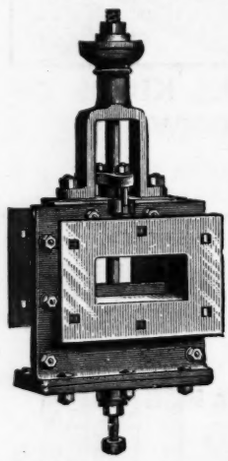

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